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Editorial Notes

High-Pressure Gasification

FEW lines of research undertaken by the Gas Industry can have appeared to offer more promise than that pursued by the Institution and Leeds University on the high pressure gasification of coal. We referred to this last week in connexion with the non-publication, in the public interest, of the 45th Report of the Joint Research Committee. In the early stages on the laboratory scale the yields of products were remarkable and the flexibility of the process seemed to open up new vistas in the treatment of coal to give refined fuels in liquid and gaseous form. Technically the results were astonishing and undoubtedly justified the effort and expenditure involved in carrying out the work. During the past twelve months the research has been carried further on a somewhat larger scale, and it is very unfortunate that war-time circumstances do not permit of the publication of the findings and explanation of any difficulties which may in all probability have been encountered, for there is a great deal of difference between the results gained on a small laboratory scale and those obtained when larger scale working is attempted. It is unfortunate, too, that the outbreak of war has led to delay in the erection and operation at the Fuel Research Station of a semi-technical plant, though we are assured that the manufacture of the necessary apparatus is well in hand.

The Research Executive Committee could only make brief reference to the work in their 5th Annual Report, a lengthy extract of which was published in the "JOURNAL" last week. We are told only that the 45th Report "draws attention to those features of possible processes where trouble is likely to be experienced and suggests means of avoiding these potential difficulties." We must, however, not become impatient because for the time being we are forced to be left in the dark, and we can, we think, with confidence leave to the good judgment of those responsible for the prosecution and conduct of this most important and most promising line of research how much time, energy, and money should be concentrated upon it. War-time conditions have already brought, and will continue to bring, problems which call for immediate solution—practical difficulties which demand short-term research of a strictly practical order. One can in the circumstances understand the temptation and the tendency to switch over to these problems available skilled workers engaged by the Industry on long-term research such as that exemplified by the work on high pressure gasification.

If the difficulties met with in the attempt to translate work on the laboratory scale to a semi-technical scale loom so large that it is deemed expedient at any rate temporarily to discontinue this fascinating investigation, well and good. But the difficulties must be demonstrably great before any such decision is arrived at even in war-time. In spite of unfavourable conditions we must look ahead. In the matter of research we must emerge from the war better equipped than when we entered into it. We must be ready to put into effective operation new methods which may as a result of research be shown to be commercially feasible. The time may come when the Gas Industry will manufacture only refined fuels in gaseous and liquid form from coal, when solid fuel, smokeless or otherwise, will be supplanted by gaseous energy at no greater all-in cost to the consumer, when the Industry will no longer have to rely on gas-making coals, but will be able to process coals of any type. That time is not yet, but war should not allow us to shut our eyes to the possibilities of a Gas Industry on a new and very different scale or cause us to lose heart in an investigation which in its early stages showed such promise and gave rise to new conceptions of the Gas Industry as a source of heat energy and of chemical products. High pressure technique is being more thoroughly understood month by month and week by week, and we look upon research by the Industry on this new technique as a form of insurance rather than a plaything of the dreamer.

Combustion Characteristics

MUCH more work has been carried out during the past twelve months on the combustion characteristics of gas—work which should prove of very great help in maintaining a satisfactory gas service in times of emergency, when normal gas making procedure may have to be modified and when conditions may necessitate sudden changes. Alterations in the combustion characteristics of the gas supplied affect the efficiency of appliances in use, the more so with the developments which have taken and are taking place in appliance design. The

greater the refinements the greater the influence of changes in gas composition and properties. Apart from thermal efficiency, such changes may cause serious inconvenience to the consumer. They may cause the gas either to light back or to blow off at the burners. Investigation during the year—continuation of work previously undertaken and reported on—has thrown new light on the subject, which is undoubtedly one of many complications.

It will be recalled that at last year's Autumn Research Meeting of The Institution of Gas Engineers the 42nd Report of the Joint Research Committee and Leeds University gave the results of an investigation on the original type of aeration test burner (Model A), and outlined the precautions to be observed in its maintenance and use. That burner has proved of considerable service. We had last year, for example, the practical results of its use at Bournemouth in remedying frequent complaints of the seeming maladjustment of appliances, in spite of the gas being of reasonably constant calorific value. Special measures were taken to maintain a uniform aeration test burner number, but work has shown that the production of gas within close limits of aeration test burner number does not necessarily involve special supervision. In fact, the supervision normally exercised in producing gas of a uniform calorific value may also produce gas within the desired aeration test burner limits. Since that Report we have had the Report on the same subject by Dr. Haffner, the Arthur Duckham Research Fellow, who examined mixtures representing almost all types of gas likely to be distributed in this country as town gas. Some of the results of this investigation are embodied in a section contributed by the Gas Light and Coke Company to the 44th Report of the Joint Research Committee, which, had it not been for the outbreak of war, would have been presented and discussed at the Autumn Research Meeting of the Institution which was to have been held a fortnight ago. The Report—together with other Communications which were to have been presented at the meeting—has, however, been published by the Institution. We give an extract from it in the "JOURNAL" to-day, and written contributions to its discussion are invited. This applies to all the published Reports and Papers.

A Wartime Aid

Several practical points have been established which will help gas undertakings to face without undue disturbance to the consumer wider variations than normal in gas composition and calorific value. There is no doubt that the aeration test burner can provide the works engineer with a useful check on quality. By its use engineers should be in a position to know that if the aeration test burner number varies by more than a certain percentage either way from an average figure trouble may be experienced on the district. Regarding the effects of changes in composition of gas, the main danger is from a fall in aeration test burner number leading to lighting back of appliances and noise. A rise in A.T.B. Number may cause a fall in efficiency and also incomplete combustion. A fall in calorific value is usually accompanied by a fall in A.T.B. Number. It has been shown that to obtain a resultant town gas of given calorific value, dilution by waste gas gives the least fall in A.T.B. Number, then producer gas, then blue water gas, and lastly carburetted water gas, the fall in A.T.B. Number increasing with the degree of carburetting. The higher the calorific valwue of the diluent gas, the greater is the effect on A.T.B. Number, and there is a smaller fall in A.T.B. Number if the coal gas is debenzolized before dilution to the desired calorific value. These findings will prove of particular value in circumstances of emergency bringing about changes in gas composition due to efforts to meet increased loads, benzole washing, failure to obtain the usual supplies of gas making coals, and possible deterioration of plant. An instrument such as the aeration test burner, capable of indicating approach to conditions unfavourable to the satisfactory operation of gas appliances, even if only approximate in its indications, should prove of great service.

The investigation described in the 44th Report of the Joint Research Committee was concerned first with the further examination and development of the aeration test burner, and secondly with experimental work to establish the relationship between the A.T.B. Number of town gas and its behaviour in domestic and other gas appliances. Model B instrument has now been developed, which is an advance on Model A, but, it is pointed out, while new instruments and replacements should preferably be of Model B, the original model should continue to give useful service. The new instrument works on the same principle, but it has been improved in mechanical detail, range, and permanence of calibration. It was a Registered Design of the Gas Light and Coke Company, who authorized the assignment of the rights to the Institution, so that the burner might become available to the Industry generally. The empirically defined scale of the new burner differs materially from that of the original one, and for this reason a conversion table is given in the Report; and it has been decided to use the new scale for stating the combustion characteristics of gas in terms of A.T.B. Number. It is to be hoped now that we have got down to a standard instrument and a standard scale, for it would obviously be absurd to bring out a new scale every now and again and with it a new set of conversion figures.

In regard to the second part of the programme—establishment of the relationship between the A.T.B. Number of town gas and its behaviour in appliances—a number of gases of 500 B.Th.U. have been tested, but the range of numbers has been inadequate to justify the drawing of general conclusions from the work at Leeds; and the Joint Research Committee has suspended the investigation for the time being and the publication of the results obtained to date. The Report does, however, include, in the section contributed by the Gas Light and Coke Company, a table setting out the permissible variation in A.T.B. Number of town gas (500 B.Th.U.) with different appliances.

A New Approach

Concurrently with the investigation described in the 44th Report, work has been in progress on the combustion characteristics of town gas and its constituents in the laboratories of the South Metropolitan Gas Company, and the results to date formed the subject-matter of an Institution Communication by Messrs. Fuidge, Murch, and Pleasance. The approach to the problem in this instance was on quite different lines and the enquiry was of a more fundamental nature. It was considered that test burners, such as the aeration test burner, though possibly suitable for controlling the combustion properties of the gas output of a works, were unlikely to enable a detailed comparison of the relative values of different gases to be made. The aim was, in brief, to find out what were the combustion characteristics of various gases, as distinct from evaluating empirically the effects of unknown quantities. The work is as yet in the preliminary stages, and the Authors admit that the information which has been obtained is insufficient for any conclusion to be reached as to the mixture of gases which, from the point of view of combustion characteristics, would form the most suitable town gas. However, the results already obtained do indicate the possibilities of the method of approach.

The method is ingenious and fascinating. It involves the analysis of "combustion" and "aeration" diagrams. The former consist of a set of curves defining the limits of firing back, blowing off, and luminosity in terms of thermal input and air-gas ratio. The aeration diagrams show the gas consumptions and air-gas ratios obtained in a standard bunsen burner using a number of different orifices at various pressures. By superimposing one diagram on the other a combined diagram is obtained which enables comparison to be made between different gases as regards their liability to back fire,

blow off, or give luminous flames in bunsen burners. A number of typical town gases with a calorific value of 500 B.Th.U. per cu.ft., representing different methods of manufacture, were examined. They corresponded to gases produced by carbonization in continuous vertical retorts with limited steaming, in horizontal retorts without benzole recovery, in horizontal retorts with benzole recovery and dilution with carburetted water gas, and by carburetted water gas plant. The deductions drawn from the diagrams appear to be in accord with general experience of the behaviour of such gases. One of the findings which has much practical significance is that in order to give flames of the same characteristics it will be necessary not only to alter the size of gas orifice for different gases but also to adjust the supply of primary air. In other words, to cope with variations in combustion characteristics of gases, burners will be required to be fitted with provision for the adjustment of both gas and air.

The diagrams suggest that the combustion characteristics comprise a complex set of properties, and the Authors query whether these properties can be adequately represented by a single number such as that obtained by the use of the aeration test burner. What is needed now is work to establish the connexion between the aeration test burner and the combustion and aeration diagrams.

The foregoing constitutes a brief outline only of the way in which work on combustion characteristics has progressed during the year—peace-time investigations the application of the findings of which, however, should assist in maintaining a high standard of gas service in spite of emergencies on the manufacturing side.

Hire Purchase Again

FROM the widespread interest aroused by the review of the war-time gas appliance hire-purchase situation published in the "JOURNAL" a fortnight ago, we are led to believe that many of the gas undertakings that withdrew "instalment" facilities on the outbreak of war are realizing that such an interruption in the free flow of appliances from maker to user is not only disturbing the balance of supply and demand but is making it less easy to maintain that goodwill and consumer satisfaction upon which gas sales have always been based. While we appreciate the difficulties to be faced, it is noteworthy that some undertakings have seen their way to carrying on as in peace-time. A case in point is Nottingham, whose Gas Department decided right from the beginning that it should carry on with all its service activities until it was absolutely forced to relax them. It has never discontinued its hire-purchase practice and so far it is satisfied that it has done the right thing in continuing to give as good a service as before and possibly even better. "We at least have the satisfaction of feeling," says Mr. Dixon, "that we are continuing to employ all the members of our fitting staff and the goodwill we have been trying to build up over the past few years is not in danger of slipping back. It may be argued that there is a little more risk to be taken by the Department, but we only regard this as the same as any other business house has to face and we are not frightened of it." From Burnley we learn that the Gas Committee hopes soon to be able to resume borrowing in order to buy appliances for hire-purchase sales.

There are, however, still many undertakings, noted for their sales consciousness, that are declining under any circumstances to part with new appliances otherwise than by cash sales or simple hire—undertakings that would be among the first to complain if they found that as the result of their action the makers were compelled by economic circumstances to relax their research and development work. Since we have been investigating this question of hire-purchase we have become only too familiar with the argument that the risks of failure to complete the payments and the doubtfulness of recovering unpaid-for appliances from the homes of people adversely affected by war conditions are too grave to be faced in these days of financial strain. And we have begun to wonder whether, always assuming that the business is handled with due caution, there is any more ground for the argument than there would be for a shopkeeper to barricade his shop window for fear of a smash and grab raid and thereby lose the bulk of his trade. Business to-day is founded very largely upon confidence in human nature, and it will be a bad day for this country when the business world loses that confidence.

No figures are available as to the relative proportions of cash sales, hire-purchase, and simple hire, but it is obvious that for many years past hire purchase has been the biggest factor in creating consumer satisfaction and building up goodwill, and therefore if we regard the question solely from the point of view of an undertaking's prosperity we are forced to the conclusion that hire-purchase pays, in the long run. Have those who have stopped instalment selling seriously considered what will happen if the war goes on for a number of years? Where will be the satisfied consumer if new appliances are restricted to cash sales and simple hire, and where will the undertakings look for new models if the makers have been forced to curtail their research and inventive enterprise?

There is more in this war-time hire-purchase question than meets the eye. It cannot be denied that in pre-war days the instalment system attracted a certain amount of business that was actually more bother than it was worth. A water softener manufacturer told us a day or two ago that what he called "super salesmanship" had yielded hire-purchase business that could be divided into 30% wholly unsound, 20% a source of constant anxiety, and not more than 50% that could be counted upon to reach satisfactory completion. Excessive eagerness on the part of the salesman to show big figures had produced hire-purchase signatures from people who could never hope to meet their obligations, and such questionable tactics as sharing of commission between salesman and purchaser had only made matters worse. To-day the whole position is changed and the same manufacturer is of opinion that at least 99% of the business he is getting is absolutely sound. The customer who asks for "terms" to-day does so because of a genuine need or desire for a particular appliance, knowing that he will not get it unless he can give reasonable evidence of his ability to pay for it.

That there are hard cases is not disputed. There is, for instance, the case of the consumer giving up his house during the period of his service with the colours. What is there to prevent such a consumer handing back his appliance to the undertaking and asking for a cancellation, or suspension of his hire-purchase agreement, on the understanding that, while the particular appliance may either be stored for him or put to some other service, there shall be an appliance in a corresponding condition of wear and tear available for issue to him on his return, with an appropriate resumption of his agreement for the remainder of the period for repayment? Every undertaking bold enough to continue hire-purchase facilities will encounter hard cases, and we do not presume to lay down any general solution of their problems, but "where there's a will there's a way," and we refuse to believe that there is any district where ways and means cannot be found for continuing to offer easy terms, albeit on a war-time basis, and thus preserving that goodwill which the precipitate suspension of hire-purchase is so liable to destroy.

Need For Trained Fitters

THE outbreak of war caused much dislocation in many centres organized for the teaching of Gas Industry subjects. The black-out, travelling difficulties, evacuation, general anxiety and uncertainty had their inevitable effect in breaking up for the time being established classes for the training of young entrants to the Industry's ranks. Fortunately, many of the gloomy expectations of the immediate effects of modern warfare on the grand scale have not in fact so far been realized and there has been breathing space in which to collect thought

and to an extent replace action in regard to education needed by those who wish to fit themselves for a useful career in the Industry. We referred in the "JOURNAL" last week to the arrangements decided upon by the City and Guilds of London Institute in regard to the 1940 series of examinations, which it has planned to hold as far as circumstances permit.

The decision covers all examinations in technology, all those dealing with gas subjects. There will be no change in the arrangements for examinations which are conducted by written papers only; but in those subjects in which the examinations include practical test and in which the entry is large special arrangements for the assessment of practical work will be introduced. In the list of the examinations to which the special arrangements for practical tests will apply are included Gas Fitting, Grade II, Practical, and Final Practical; and principals of colleges are asked, whenever possible, to accommodate external candidates for the special practical tests. It should be mentioned that, while the Institute intends to maintain fully the general standard of its examinations, it recognizes the difficulties under which instruction and study will have to be carried on, and has arrived at the conclusion that examiners should give a wider choice of questions. Technical institutes and colleges in the London area and in the provinces are reopening to cater for the needed instruction, and we learn that enrolment lists are in the circumstances very satisfactory.

For our part, we too are trying to lend what aid we can to the student, and among our war-time efforts was the publication last month of the "Manual of Practical Gas Fitting," by Mr. R. N. Le Fevre, which, running to over 460 pages and published at a peace-time price, is a complete tutor for all the practical gas fitting examinations. We felt that the issue of this authoritative work would be a service appreciated by the Gas Industry and the many hundreds of young men, both experienced and inexperienced, engaged in learning or practising gas fitting.

Food Rations

Rationing is a question of great moment to all, and, although the actual allowances have now been official announced, the housewife will need help, especially at the outset, in adapting her catering routine to the altered circumstances. In this, as in all questions of food and dietetics, the Gas Industry will be able to be of a great assistance, and we congratulate Radiation, Ltd., on being very early off the mark. They have sent us a copy of a supplement which they have prepared to their useful recipe booklet, "Food for the Family," dealing with this question of rationed foods, and those foods in which there may be a shortage. Simple and interesting details of substitutes are given, with good advice on their comparative food values and nourishment. This information will be very useful to the general public in helping them to make a success of war-time catering. Radiation are offering to send the booklet complete with supplement from their Publications Department at 7, Stratford Place, W.1.

Fifty Years of Public Service

We have received from the Colonial Gas Association an interesting brochure commemorating their completion of half-a-century of public service. The Association—which now operates more than thirty subsidiaries including gas undertakings and others concerned with the working up of by-products—was one of the earliest examples of the grouping of gas undertakings under unified control which has had such a vogue in this country in recent years. The brochure, which is excellently produced and contains a wealth of illustrations of every phase of the Company's activities, tells of the Association's foundation, its major and minor triumphs, its problems and perplexities, and something of the personalities identified with its history from its inception till the present day. Among the names which have been prominently associated with the Undertaking, that of Mr. P. C. Holmes Hunt, the present Chairman and Managing Director, stands out as one who has played a major part in its development during the latter half of its existence. We congratulate the C.G.A.—now the fifth gas company in the Commonwealth in terms of output—on attaining this landmark in its history.

Personal

The United Kingdom Gas Corporation announce the resignation of Mr. C. S. WALLBRIDGE, A.M.I.E.E., internal combustion engine specialist, who, for the past six months, has been in the service of the Corporation for the development of gas power and pressure gas traction. Mr. Wallbridge, who has had wide experience in this particular field of gas utilization, was responsible for the initiation and development of Gas Power Conversions, Ltd. Much will be heard in the future of the work which this able engineer has completed, and his resignation must constitute a loss to the Industry.

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Mr. JOHN P. TRAIL, Chief Clerk at the Aberdeen Gas-Works, retired last week after 48 years' employment in the Gas Department, during 23 of which he occupied the post of Chief Clerk. The presentation was made to him by his colleagues of a wallet of treasury notes, the gift being handed over by Mr. H. S. Milne, Gas Engineer and Manager. Mr. Samuel Milne, the former Gas Engineer, also spoke.

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Mr. J. H. DANIELS has been appointed Assistant Engineer of the Canterbury Gas and Water Company. Mr. Daniels began his career with the Wallasey Gas and Water Department, leaving there in 1932 to become Assistant Manager of Messrs. Foster and Pullen, Ltd., of Bradford.

Obituary

Mr. RICHARD NELSON, Engineer and General Manager of the East Hull Gas Company, died on Nov. 1.

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A director of the Stamford Gas Company since 1915, being appointed Vice-Chairman in 1932 and Chairman two years later, Mr. EDWARD DALTON has died at the age of 70. He had been a member of the local Town Council since 1933.

Forthcoming Engagements

Dec.

7.—Fuel Luncheon Club.—Connaught Rooms, 12.40 p.m. Address by Prof. A. C. G. Egerton, on "Possible Fuels."

7.—S.B.G.I.—Meeting of Emergency Committee, Banbury, 2 p.m.

8.—I.G.E.—Joint Committee on Complete Gasification Under Pressure, Gas Industry House, 2.30 p.m.

12.—B.G.F.—Fifth Annual General Meeting, Gas Industry House, House, 10.30 a.m.

12.—Institution of Chemical Engineers.—Meeting at Burlington House (Geological Society), Piccadilly, W.1, 2.15 p.m. Paper by Prof. D. M. Newitt, on "Principles of Gas Compressor Design."

12.—N.G.C.—Central Executive Board, Gas Industry House, 11 a.m.

13.—I.G.E.—Liquor Effluents and Ammonia Committee. 12.15 p.m.; Joint Research Committee, 2 p.m.; at Gas Industry House. (These meetings are instead of on Dec. 15 as previously arranged.)

13.—Institution of Engineers-in-Charge.—Paper by C. E. Green on "The Steam Accumulator and Its Application," St. Bride Institute, E.C.4, 7 p.m.

15.—Institute of Fuel.—Meeting at Burlington House (Geological Society), Piccadilly, W.1, 2.15 p.m. Paper by Dr. D. G. Skinner and Mr. J. I. Graham on "Improvements in Calorific Value of Town Gas or Coke Oven Gas, With Special Reference to Utilization as a Fuel for Motor Vehicles."

18.—L.C.C.A.—Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Central Committee, 2.30 p.m., at 1, Grosvenor Place, S.W. 1.

News of the Week

Edinburgh Public Utilities Committee decided on Dec. 1 to leave the price of gas unchanged, the position to be reviewed in February. It was resolved to petition the Government to take steps to prevent any additional increase in the price of coal to public utility undertakings.

Borrowing Powers for £45,000 are being sought by the Burnley Gas Committee to cover the estimated capital outlay on appliances for three years from April 1, 1938. In September, restriction was placed on capital expenditure by the Treasury. Burnley hopes soon to be able to resume borrowing in order to buy appliances for hire-purchase sales.

Knitting Does Not Seem so Wearisome if women can get together and listen to some simple talk while they work. During the last fortnight Miss A. M. S. Wilson, B.Sc., the Women's Gas Council lecturer, has been giving a series of these talks to women's meetings of the Conservative Association in and near London. There is one thing common to all these meetings; the speaker is asked to deal with anything but the war, so that for a short time the audience can get away from worry. Afterwards, over a cup of tea and a biscuit, questions are invited, and then, perhaps, the worries may come uppermost again. Still, most problems have an answer; the only one that was difficult was a request to repeat a joke as the questioner had missed the point while counting her stitches. Few jokes bear repetition to the same audience!

During the Black-Out the Houghton-le-Spring and District Gas Company has proposed to the local Urban Council that the latter pay a nominal maintenance charge of 1s. per lamp per month as from Sept. 1 last until the lamps are again brought into use.

The Blackout of Darwen was relieved 100 years ago when the streets of this busy industrial Borough were first illuminated by gas. Naturally, with the intervention of the war, any celebrations which might have been projected have not been proceeded with. On August 23, 1838, a committee was elected to enquire into the introduction of gas to Darwen; estimates were evolved and the Over Darwen Gas Lighting Company (which preceded the Corporation Gas Undertaking) came into existence. Gas then cost 7s. 6d. per 1,000 cu.ft., compared with 1s. 3½d. to 3s. 10d. to-day (according to consumption), and the Directors received 2s. 6d. each for attendance at board meetings increased to 5s. in 1855. The gas-works passed into the control of the old Local Board in 1873—five years before the Borough was incorporated. Darwen now has 1,034 gas street lamps, and last year the output exceeded 205 million cu.ft.—a record.

An Error.—We regret a typographical mistake in the advertisement of Messrs. Ashmore, Benson, Pease and Co., Ltd., on p. 419 of our issue of Nov. 29. Addition of a third lift to the all-welded holder illustrated would bring the capacity up to *one* million, not 2 million cu.ft. as mentioned.

M. Boulestin to Launch a Dietetic Offensive

Those who have seen the Gas Industry films in which M. Marcel Boulestin, the famous chef, played a prominent part will have been interested to learn from a note by "Peterborough" in a recent issue of the *Daily Telegraph* what he is doing at present.

M. Boulestin, said "Peterborough," served throughout the last war on the western front, but owing to his age the French military authorities do not require his services at the moment. He is, therefore, planning to launch a dietetic offensive in this country. Under a suave exterior, M. Boulestin conceals the passion of a propagandist. He remints Napoleon's dictum by saying that a nation marches on its stomach, and he is convinced that we should absorb the culinary wisdom of France.

Towards the end of the last war M. Boulestin was attached to one of the British staffs, where his gastronomic flair was much appreciated. On one occasion he had arranged a lunch at some small restaurant behind the lines at which a number of staff officers were present. The coffee stage had just been reached. It was about to be followed by 1865 cognac, a bottle of which he had discovered in the house. At that moment the party found itself in the middle of an air raid. Amid the explosions of nearby bombs M. Boulestin rose from the table, very carefully took up the bottle of old brandy, and put it away in a cupboard, replacing it by an ordinary bottle of "fine."

"Gas Journal" Directory

In order that readers may be able to keep the particulars contained in the "JOURNAL" Directory up to date, we summarize in the following list various changes of which we have been notified during the past month:

Page 4. ATTLEBOROUGH. R. A. Weston appointed E. and M. *vice* A. L. Higham.
" 12. BRITISH GAS LIGHT (Aylsham, Diss, Harleston, and Norwich). R. A. Weston appointed E. and M. *vice* A. L. Higham.
" 12. BRITISH GAS LIGHT (HULL).—A. L. Higham appointed E. and M. *vice* C. R. Armitage retired.
" 28 GAINSBOROUGH. J. A. Derbyshire appointed E. and M.
" 36. HULL. R. Nelson, E. and G. M., deceased.
" 42. LODDON. R. A. Weston appointed E. and M. *vice* A. L. Higham.
" 52. OWESTRY. J. V. Beckett appointed G.M. *vice* E.T. Davies retired.
" 64. SOUTHPORT. H. J. Risby appointed Deputy E. and M.
" 68. SUTTON-IN-ASHFIELD. J. J. Merrell, E. and M., retired
" 131. ALBURY. J. W. Batchelor, M., resigned.
" 131. BENDIGO. J. W. Batchelor appointed E. and M. *vice* W. A. Simco retired.

Further Price Increases

In addition to the increases in the price of gas by various undertakings, referred to already in these columns, the under-mentioned advances have also been announced:

Auchterarder.—By 5d. per 1,000 cu.ft., making the price 6s. 3d. per thousand.

Cupar.—By 5d. per 1,000 cu.ft., making the price 3s. 11d. per thousand.

Deal.—By 2.4d. per therm.

East Surrey.—By 2d. per therm as from Jan. 1 next.

Galashiels.—By 2d. per 1,000 cu.ft., bringing the cost to ordinary consumers up to 3s. 4d. per 1,000 cu.ft.

Grangemouth.—By 10d. per 1,000 cu.ft., bringing the price up to 4s. 2d.

Hinckley.—By 1½d. per therm from December.

Llandudno.—By 9d., bringing the price up to 5s. 8½d. per 1,000 cu.ft.

Leicester.—By 3d. per 1,000 cu.ft. from Christmas.

Newcastle-upon-Tyne.—By 2d. per 1,000 cu.ft.

Plymouth (Corporation).—By 6d. per 1,000 cu.ft., making the charge 3s. instead of 2s. 6d.

Polmont.—By the adoption of a new scale ranging from 5s. 5d. per 1,000 cu.ft. for those taking less than 5,000 cu.ft. per quarter to 3s. 9d. for consumers taking quantities in excess of 50,000 cu.ft. per quarter.

Skegness.—By 5d. per 1,000 cu.ft.

Swadlincote.—By 1½d. per therm.

Gas Appliances

A Small Percentage Advance in Prices

Under date of Nov. 30, the following notice was issued by the firms whose signature is appended to it:

"We have maintained prices at their present level for more than two years, despite several increases in costs during this period.

"Costs have risen to such an extent, however, that we regret we are now compelled to notify an advance of 7½% on existing prices.

"This advance will apply to all orders issued by you on and after Dec. 1 next and to all quotations unaccepted at to-day's date."

Arden Hill & Co.
Bratt Colbran, Ltd.
Cannon Iron Foundries, Ltd.
Clarks Stove Co., Ltd.
Davis Gas Stove Co., Ltd.
Emscote Foundry Co., Ltd.
Falk, Stadelman & Co., Ltd.
Sidney Flavel & Co., Ltd.
Forth & Clyde and Sunnyside Iron Cos., Ltd.
Fletcher Russell & Co., Ltd.
General Gas Appliances, Ltd.
R. and A. Main, Ltd.
The Parkinson Stove Co., Ltd.
Richmonds Gas Stove Co., Ltd.
R. Russell & Sons, Ltd.
Stoves, Ltd.
Vulcan Stove Co., Ltd.
Wilsons & Mathiesons, Ltd.
John Wright & Co., Ltd.

Gas Directional Lamps as Guides to Air Raid Shelters

The Stoke-on-Trent Gas Department have almost completed the fixing of 741 lanterns to indicate the position of 224 air raid shelters. These lanterns have the wording "Air Raid Shelter," on two opposite sides, and the same wording with an arrow pointing in the direction of the shelter on the other two opposite sides. This allows the lantern to be seen in all directions. The Department are shortly to fix 223 lanterns to indicate the position of 87 wardens' posts. These lanterns will have the message "Wardens' Post" and an arrow.

The lanterns are prepared in the following manner. A stencil of the wording is placed on the panes, which are then sprayed with

black paint. This is allowed to dry, and the whole of the panes are then sprayed with transparent blue waterproof paint which allows the light to show up the message on a black ground. Under "black-out" conditions a blue spot can be seen at a distance of 200 ft. from the lantern, and the message can be easily read at a distance of 50 ft.

The light in the lantern is provided by a single No. 1 burner, with a consumption of 2 cu.ft. per hour, including the by-pass. A clock controller is fitted to the burner, set for the normal lighting period—*i.e.*, half-an-hour after sunset to half-an-hour before sunrise.

London Street Lighting Tests

Experiments with modified street lighting are under observation at the present time in a square mile of London. This is one of four lighting schemes now being tested.

A large-scale test in Westminster has been offered to the Home Office by the City of Westminster. In a letter to Sir John Anderson, the Westminster Town Clerk states that the results of the Liverpool trial have led the Emergency Committee of the City Council to believe that it would be practicable to devise a system of modified street lighting for London. The Council would be glad to co-operate with the Government in any further experiments.

The offer, it is understood, will not be taken up by the Home Office because it is felt that the four tests now being made will provide sufficient material on which to base future regulations.

B.C.G.A. Christmas Display Aids

A group of attractive Christmas display aids has been produced by the B.C.G.A. Studio for the benefit of member undertakings.

The display unit has been designed with a view to economy, for the sprig of holly can be removed when Christmas is over, leaving a seasonable display that will do service for many weeks to come. Of convenient size (5 ft. by 4 ft.), it is colourful and decorative, and included in the scheme is a charming photographic enlargement. The poster, showcard, and window strip link up with the theme of the display, and have also been produced in pleasing colours.

These effective display materials will go a long way to making the Gas Industry's windows bright, attractive, and seasonable for Christmas.

Liverpool Gas Development Centre

Production of Fine Brochure

An exceedingly attractive and well-produced brochure has been issued by the Liverpool Gas Company by way of illustrating some of the apparatus available at the new industrial showrooms and laboratories at the headquarters of the Liverpool Gas Development Centre.

Entitled "Gas as an Ally of Industry and Commerce," the brochure is strikingly bound, on the loose leaf principle, in black and gold, the front cover design symbolizing Mr. Therm extending a helping hand to industry. The opening pages give photographs of the industrial showrooms and a list of the member undertakings, with their Chief Executive Officers, of the Liverpool Gas Development Centre. It is pointed out that although the industrial showrooms are equipped with a large variety of appliances, only a small proportion of the gas apparatus used in 3,000 trades can be shown. The object of the brochure, therefore, is to give some idea of the assistance which this branch of the Gas Industry can give, at the same time emphasizing that the services of trained industrial engineers are at the disposal of those contemplating new works or extending existing premises in West Lancashire, West Cheshire, and North Wales.

Well indexed and comprehensively illustrated throughout, the publication is divided into six sections—Baking, Kitchen Equipment, Heating (including Central Heating), Furnace Treatment, Hot Water, and Sundries. The whole arrangement is admirably carried out, and by way of emphasizing the efficiency and modernity of gas the last few pages are devoted to photographs illustrating some of the installations recently completed by the Liverpool Gas Company.

The Company are to be congratulated on the production of this noteworthy publication.

Glasgow Price Increase

The Glasgow Corporation Gas Committee decided on Nov. 24 to raise the price of gas to domestic consumers from 3s. to 3s. 8d. per 1,000 cu.ft. and to industrial consumers from 1s. 5d. to 1s. 8d. The new scale will operate from the mid-December survey.

Councillor Thomas Wilson, J.P., and Councillor Alexander Ritchie, the Convener and Sub-Convener of the Committee, issued a joint statement in which they explained that loss of revenue, amounting to £13,000 monthly or £150,000 annually, had been incurred through a loss in consumption of 3,500,000 cu.ft. daily, due to the elimination of street lighting, the evacuation of domestic consumers, curtailed catering, and restrictions due to black-out regulations. Economies in direct production charges and reduced use of coal had been offset by the recent increase of 1s. per ton in coal and rising costs of other materials, and the increase was necessary to balance the accounts of the Department for the current year, which ends on May 31.

The Glasgow increase is equivalent to 1.7d. per therm.

The Glasgow Town Council adopted the Gas Committee's recommendation by 49 votes to 26. Expressing disapproval of the increase, Councillor John Henderson said the Department, including last year's deficit, had incurred a loss of £172,498, and the Gas Committee was incapable of controlling it. An amendment that gas be bought by the Corporation from the coke ovens of Messrs. William Dixon, Ltd., was defeated.

In this connexion, it is interesting to note that a new offer has been made by Messrs. William Dixon, Ltd., to supply 5 million cu.ft. of gas daily to the Corporation at a cost below that at which the Corporation can manufacture. A sub-committee has been appointed to confer with the firm. It will be recalled that a similar offer made by the firm eighteen months ago was rejected.

Behind the Scenes in Industry

In a series of illustrated articles under the above heading which have appeared in the *Argus* Week-end Magazine, published in Melbourne, that on September 23 dealt with the activities of the Parkinson Stove Company (Aust.), Ltd. in the production of modern enamelled gas cookers, fires, and radiators.

The photographs showed various stages in the manufacture of up-to-date appliances at the Footscray Works—from the foundry in which the iron castings are produced to the final assembling and packing of the finished articles. As a branch of the organization so well known in the gas appliance market in this country, which has had over 120 years' association with the Gas Industry, the Australian Company has, since its inception in 1927, built up a thriving business, giving employment to approximately 200 people.

Fifty Years of Public Service

A Landmark in the History of the C.G.A.

To mark the completion of its first half-century of public service the Colonial Gas Association has published a very fine brochure, in the foreword of which the Directors point with pardonable pride to a record of achievement and feel that all concerned will share their satisfaction with the development of the Association from its humble beginning in 1888.

The brochure, which is excellently illustrated by photographs of the Association's leading personalities and of various aspects of the Association's work, gives, not in strict chronological order, but in a manner intended to stimulate interest, collected evidence of progress. It tells of the Company's foundation, its major and minor triumphs, its problems and perplexities, and something of the personalities identified with its history right from its inception till the present time.

It is not, perhaps, out of place to record that the Colonial Gas Association—which now operates or controls more than thirty subsidiaries—was one of the earliest examples of the amalgamation and grouping of gas undertakings under unified control such as has been witnessed in this country to a considerable extent in more recent times. Of all the names which have been prominently associated with the Company in recent times that of Mr. P. C. Holmes Hunt, the present Chairman and Managing Director, is stamped indelibly on the Company's history. He has been closely identified with the Association for twenty-five years and has played a major part in its development from a rather obscure gas company, with a number of country gas-works scattered over Australia, to its present position—the fifth gas undertaking in Australia in terms of output—with substantial interests in the metropolitan areas of Melbourne and Brisbane and a variety of subsidiary enterprises principally connected with the exploitation of gas-works by-products. During the fifty years of its existence the Association's capital has been increased from an original of £250,000 to the present figure of £1,250,000, while in the same period the gas sales have grown from just over 4 million cu.ft. per annum to more than 661 millions.

Among the many interesting photographs in this commemorative brochure is a double-page spread of illustrations of some of the Associations up-to-date window and showroom displays, while the text includes sections devoted to articles on some of the problems which have had to be faced, on gas legislation, tariffs, changes in gas utilization during fifty years, on the development in by-products, publicity, display, and home service. Indeed, the brochure touches upon every phase of the Association's many and varied activities and in itself constitutes a notable landmark in the history of a progressive undertaking.

Radium and Cancer

In a paper recently read at the Royal Society of Arts, Sir Leonard Hill, the famous physiologist, challenged the efficiency of radium in the treatment of cancer. His view was that the radium in the country, which has now been buried for security in the national emergency, might be left there altogether. According to Sir Leonard, modern X-ray treatment has definitely proved superior to radium, and is not so difficult to use.

Sir Leonard Hill has been a Director of Radiation Ltd. for a number of years.

London and Home Counties Demonstrators' Circle

Formal meetings are not encouraged by the Government these days, and travelling under black-out conditions is difficult; but the members of the London and Home Counties Demonstrators' Circle want to keep in touch with each other, and an informal meeting of the Circle was held on Saturday, Nov. 25, at 1, Grosvenor Place.

Miss Willans (Chairman of the Circle) gave the members present some advice on points which they should stress in demonstrations on economical cookery when rationing is in force. She said that they should warn their audiences against too starchy a diet. During the last war when rationing was introduced many people turned over to a carbohydrate diet, with the result that whole families went down like ninepins in the influenza epidemic. Housewives need to be taught the value of using the ration they are entitled to, and also to be shown the importance of using fresh fruit and vegetables.

When preparing demonstrations under present conditions members would have to watch the markets carefully; not only would they have to be careful to use foodstuffs in season, but also to watch the material sent to the shops as merchant ships arrived in this country, and the cargoes were released.

Miss Baldwin (Croydon) said that audiences appreciated being shown how to make cheap cuts of meat into attractive meals, such as braized flank, and how small details like the blanching of rabbits made all the difference to the flavour of the dish. It was also suggested that demonstrations attracted more attention when they were advertised under snappy titles such as "Breakfast without Bacon" and "Heads and Heels." The Chairman asked if anyone had a new name for offal. "Innards" and "Inside Information" were suggested.

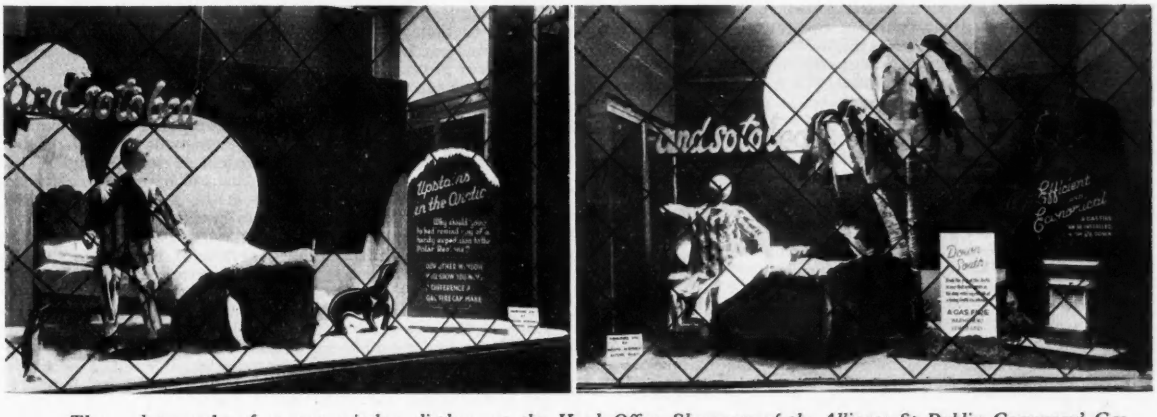
Miss Willans gave a short account of the interview between delegates of the Federation of Business and Professional Women and the Women Members of Parliament. Miss Willans was one of the delegates. The unemployment among highly qualified women was the subject brought before the members of Parliament, who gave the delegates a sympathetic hearing and promised to see the Minister of Labour on the matter.

Wales and Monmouthshire Junior Gas Association

Owing to the prevailing conditions, the normal activities of the Wales and Monmouthshire Junior Gas Association during this session have been postponed. However, in order that the interest in the Association will not be lost, it has been decided to hold two meetings, one in December and the other in the New Year.

The December meeting was held to-day at the office of the Cardiff Gas Light and Coke Company, Bute Terrace, at 3.15 p.m., when Mr. A. J. Cruise, late of the aforementioned Company, read a paper entitled "Recent Developments and their Influence on the Utilization of Gas as a Fuel." Tea was provided after the meeting by kind invitation of the Cardiff Gas Light and Coke Company.

In order to be able to carry on the activities of the Association in the future, a subscription of 3s. 6d. will be levied, a portion of which will be allocated to the Octavius Thomas Memorial Fund, and the remainder to the bank balance.



These photographs of current window displays at the Head Office Showroom of the Alliance & Dublin Consumers' Gas Company have kindly been sent us by Mr. W. K. Kimberley, the Display Manager. The two displays are, of course, related and together put across the story of gas for bedroom heating in a novel and striking manner. The grotesque jointed figures are painted blue and red respectively, and "cold" and "warm" colour schemes are introduced into clothing and other effects to emphasize the theme of the displays.

ANNUAL MEETING OF THE

Association of Public Lighting Engineers

The Annual Genera Meeting of the Association of Public Lighting Engineers was held at St. Ermins Hotel, Westminster, S.W.1, on Tuesday, Nov. 28. (The meeting should have been held during the first week of September, in Glasgow, but the arrangements had to be cancelled owing to the outbreak of war).

THE retiring President (Mr. C. H. Woodward, A.M.I.E.E.), who occupied the Chair during the early part of the proceedings, congratulated the members on the very good attendance.

It was announced with regret that Mr. H. Dodimead, a founder member of the Association, had died suddenly, and the meeting observed a period of silence as a tribute to his memory.

Mr. W. J. Bache (Cheltenham) and Mr. J. H. Clegg (Southport) were announced to have resigned from the Council, and thanks were expressed to them for their services to the Association.

There was no discussion on the Council's report for the year 1938-39, which contained statistics of public lighting throughout the country. The report was adopted.

The members also adopted the report of the Hon. Treasurer (Mr. H. C. Brown), who said that membership had increased during the year, as had also the revenue and expenditure. The credit balance was increased from £688 to £959 during the year.

The general regret that the members were unable to meet in Glasgow in September was expressed by the retiring President. He also voiced the gratitude of all to the incoming President (Mr. E. J. Stewart, Inspector of Lighting at Glasgow) and his colleagues, as well as to Mr. H. O. Davies (Secretary of the Association) and his staff for their very hard work in connexion with the arrangements for the Glasgow meeting, which it was hoped, was merely deferred.

Mr. E. J. Stewart, M.A., B.Sc., was invested with the Presidential badge of office, and formally occupied the Chair. The good wishes of the members were expressed to him by the retiring President.

Mr. H. W. Gregory, M.I.E.E. (of Harrow), was elected Vice-President, and Mr. H. C. Brown (Gas Light and Coke Company) was re-elected Hon. Treasurer.

The following were elected to the Council by ballot:

Mr. C. I. Winstone (Gas Light and Coke Company) (Past-President; re-elected).
Mr. T. Wilkie (Leicester) (Past-President; re-elected).
Mr. H. Singleton (Huddersfield).
Mr. W. N. C. Clinch (Brighton; re-elected).

It was announced that the vacancies resulting from the retirement of Mr. Bache and Mr. Clegg would be filled by co-option by the Council.

To the retiring President, Mr. Woodward, the thanks of the Association for his long and valuable service were expressed, and he was presented with his Past-President's badge and certificate.

An Invitation from Glasgow.

Mr. J. F. Colquhoun (Past-President) (Sheffield), repeating the hope that the conference which had been arranged to be held in Glasgow last September was merely postponed, said that while it would be improper to put forward a formal resolution on the matter, he would like an expression of opinion as to whether the next conference of the Association should be held in Glasgow, as a guide to the Council, so that appropriate action could be taken when normal activities were resumed. The members indicated that they would like the meeting to be held in Glasgow. At the afternoon meeting, Bailie R. Gemmell (Convener of the Police Committee and Lighting Sub-Committee at Glasgow) extended on behalf of the Corporation an invitation to hold the conference in Glasgow next year in the event of the war having terminated.

Arising out of a suggestion by Mr. L. E. Buckell that the Association would benefit by the inclusion of representatives of the Associates on the Council, Mr. Wilkie said the matter had already been considered, and a proposal would be made at some future date that two Associates should be elected to the Council, representing gas and electrical interests respectively.

In reply to Mr. E. C. Lennox (Past-President), who asked for an indication of the position of the Association during the war, the Secretary said that surely the Association could continue to be a very useful meeting place for manufacturers and lighting engineers. It was felt that the Association should not lower its flag, and it would keep going as far as possible during the war.

Mr. R. Lee (St. Pancras) asked if the Association was associated with the Home Office experiments which were being carried out in the hope of relieving restrictions. The Secretary replied that there was a Joint Lighting Committee convened by the Illuminating Engineering Society in collaboration with the Home Office, and the Association was represented on the Committee by Mr. Stewart.

Another question raised by Mr. Lee was the possibility of holding regional meetings throughout the country for the discussion of problems in connexion with the black-out. It was intimated that the Council would consider the suggestion.

Mr. S. J. Patmore asked if the question of professional status had been settled. Mr. Wilkie replied that provision was being made for the admission to the Association of those who had passed the Examination of the City and Guilds of London Institute, though they would not be full members; it was not the intention to alter the status of a full member who was a direct representative of a local authority.

A suggestion was made by Mr. W. J. Bache that probably the Home Office felt very much as did lighting engineers with regard to public lighting during the war period, but that the R.A.F. Fighter Command was opposed to any degree of public lighting; therefore, it might be a good thing to try to put the case for public lighting before the Fighter Command. Mr. Lee added that any such attempt should be made through the Home Office, and that there should be no attempt to by-pass that authority.

Following the annual meeting there was an informal luncheon at which the Association welcomed Mr. C. W. Johnson (Under Secretary of State at the Home Office).

DISCUSSION ON THE LIGHTING RESTRICTIONS.

At the afternoon meeting **Mr. C. W. Johnson** (Under Secretary of State at the Home Office) discussed lighting restrictions and said the Government had set out to achieve as nearly as possible an absolute black-out. It was not possible to achieve a 100% black-out all the time, but the view was that if raiders were prevented from identifying their targets, that position was worth having. Industrial and other lighting had to be considered as well as street lighting. It had taken quite a long time at the outbreak of war to get the black-out well in operation; if the authorities started "letting up" on any kind of lighting, it would spread, and it might take an appreciable time and a good deal of effort to get back to the present position, if that should be necessary.

Some lighting was essential for railway marshalling yards, certain constructional processes, and many other things, in order to maintain essential services. That kind of lighting was reduced to the intensity which was considered to be safe, and was allowed on condition that adequate and water-tight arrangements were made to turn it off when an air raid warning was given.

Some towns could turn off at short notice a part of their street lighting; he believed that very few were able to turn off the whole of their lighting quickly. But there seemed the possibility that, if street lighting were switched off suddenly when an air raid warning was given, when people were looking for shelter, panic might arise. Therefore, the authorities had proceeded on the basis that if there were street lighting it must be such as could safely be left on. Experiments made before the war had indicated that an intensity of 0.002 foot-candle on the ground could be allowed in places such as railway station platforms, which usually had canopies, and where the areas were comparatively small. In street lighting the areas were much greater and there were no canopies, and aerial observation had shown that 0.002 foot-candle was not safe. Experiments were being made with intensities of 0.0005 foot-candle or even less, sufficient to enable people to avoid falling over sandbags, lamp-posts, &c.; but before a decision could be made, other parties concerned in the general policy must be satisfied that it would be safe to allow that light.

Bailie R. Gemmell (Glasgow) urged the opinion of Glasgow that there should be a modified system of lighting in the public streets. He said there were 20,000 controlled lights in the city which could be lit in four seconds and could be extinguished in the same time. The authorities were prepared to fit up a main street in the city to show what could be done, and it was hoped the Home Office would allow that to be done. The lighting of stair-heads in the many tenement dwellings in Glasgow had presented a problem, and 63,000 out of 95,000 stair-heads had been lit. Some lights had also been provided under railway bridges, and were of considerable benefit to the public. He referred also to the glow from blast furnaces in the neighbourhood and to the lights in shipyards, &c., and said it was claimed that the glow from furnaces could be extinguished within seven minutes; if that were so, and if street lighting could be extinguished in four seconds, it was felt that some street lighting should be allowed.

Mr. **P. Good,** who is associated with the British Standards Institution and with some of the experiments made by the Joint Committee of the Illuminating Engineering Society, the Association of Public Lighting Engineers and the Home Office, said that the Committee accepted the Government's view that, at all events for the present, the black-out should be as complete as could be achieved. Street lighting had to be correlated with all other aspects of lighting. The endeavour was to provide an effective measure of street lighting, properly correlated with all the other aspects of the problem, and to submit it to aerial observation and to consideration in the light of the knowledge that had been gained. A scheme had been found which might prove satisfactory, at an intensity which could be allowed to remain on, and the workers were astonished that it was possible to produce effective street lighting at the levels at which they had been working.

Inconsistent.

Bailie Horne (Edinburgh) urged that 90% of the citizens of Edinburgh would rather run the risk of an air raid now and again than run the risk of death by accident in the streets every evening throughout the year. Huge docks, railway sidings, and prisoner-of-war camps were lit up, and motor cars, each with three lights, were allowed to stand in the streets for hours. Yet there was no street lighting. The Home Office was very inconsistent, and he called for some modified system of lighting.

Mr. E. E. Hoadley (Maidstone) could see no reason why, in towns and cities where the whole of the street lighting could be extinguished in, say, 90 seconds as the maximum, some modified form of street lighting should not be allowed. As to the suggestion that the sudden extinguishing of lights in the event of an air raid would cause panic, he could not imagine that the panic would be greater than might occur in an already darkened street. But even in streets which were dead black, direction lighting was of considerable help. With regard to the statement by the Fighter Command that a light haze over a town could be seen from a distance of 50 miles in suitable weather conditions, he said that surely air raid warnings could be given before enemy aircraft were within 50 miles of their objectives.

Alderman Thraves (Sheffield) pleaded for some alleviation of the tremendous strain on public service vehicle drivers, and for some form of lighting at pedestrian crossings, as, for instance, by a streak of light directed from the kerb.

Mr. T. Wilke (Leicester) said that an intensity of 0.0005 foot candles was better than nothing, but surely cities having control systems should be allowed a little more.

Mr. Burrell (St. Helens) was opposed to the sudden extinction of lighting, and he believed we should have eventually a modified scheme of lighting which would remain on and would assist rescue work, &c., after a raid.

Mr. Johnson, replying to some of the points raised, said that the Home Office had not the last word as to what should be done, but had to carry out a policy which was thought to be in the national interest. An airman might know more or less his position in the dark, but not with exactitude, and if the lighting in a town were not extinguished quickly enought it might just give him that last indication of position which a raider would require. As to controlled lighting, he believed there were relatively few places in the country having 100% control. Screening measures for furnaces were being developed. For assisting the repair of broken sewers, he imagined that large flares at the scene of operations would be more useful than dim street lighting. With regard to fog, even in peace-time flares were used.

For clearing up after air raids, he would have thought that localized lighting would be better than a reduced general system of street lighting.

The Hydrogenation Process

PARTICULAR interest attaches at the present time to a report* issued by the Department of Scientific and Industrial Research, dealing with the hydrogenation process. The report describes the results obtained in a semi-technical-scale plant at the Department's Fuel Research Station, where extensive investigations into many aspects of the hydrogenation process have been in progress for a number of years.

Earlier reports have dealt with small-scale experiments made with the object of examining the underlying principles of the process, and particularly the effects of variations in the conditions and materials employed—*viz.*, the temperature and pressure, the catalyst, the type of raw material, and other factors. With the knowledge and experience so gained, it was logical to consider next the problems of production on a full industrial scale. It was realized that the design, operation, and results obtained might be considerably influenced by this increase in scale, and it was decided to build an intermediate-scale plant, large enough to indicate the differences to be expected in full-scale operation. A plant was therefore designed to treat from 200 to 400 gallons of raw material per day, and the operation and results obtained form the subject of the present Paper.

In the design of the larger plant a major difference lies in the method of heating the raw materials and maintaining the desired reaction temperature. The method employed in the small-scale plants had been to apply the heat direct to the converter or reaction vessel by means of either external or internal electrical heating. External heating of the converter was for certain reasons unsuitable for the large-scale plant, and internal heating was at first visualized. Experiments with a small-scale internally-heated converter showed, however, that the heat of reaction was nearly sufficient to heat the incoming raw materials to the reaction temperature, and this at once suggested a method of heating for the larger plant. The raw materials are raised to a temperature of about 300°C. by heat interchange with the products leaving the converter, and they then pass to a gas-fired coil (the pre-heater) where the temperature is brought to about 400°C. At this temperature they enter the converter, where the ensuing reactions cause a further rise to the desired reaction temperature, which in these experiments was normally about 500°C.

The raw materials consist of hydrogen, and low-temperature tar from the Fuel Research Station's narrow brick retorts, to which is added a controlled proportion of "recycle oil." "Recycle oil" is the residue of the hydrogenation product after removal of the motor spirit by distillation. From a mixing tank the tar and oil are pumped at the required pressure, usually 200 atmospheres, into a high-pressure pipe-line, where they are mixed with hydrogen at the same pressure and passed through the heat interchanger and preheater to the converter. The plant has been designed to operate at 200-400 atmospheres pressure, with a throughput of 200-400 gallons per day at 200 atmospheres and considerably higher throughputs at 400 atmospheres.

The converter is a vertical cylinder of forged steel, 13 ft. long and 16 in. in internal diameter, with walls 3 in. thick. The reaction chamber, suspended concentrically within the converter, is 11 ft. long and 8 in. in internal diameter, with walls of $\frac{5}{16}$ in. chrome-nickel steel. It is fitted with internal radial fins to assist the distribution of heat and of liquid raw material, and is filled with a granular catalyst consisting of molybdenum disulphide supported on alumina gel.

The products leaving the converter pass through the heat interchanger and a water-cooled condenser to a high-pressure separator, where the residual gas is removed. The liquid products are then released into a low-pressure separator, in which dissolved gas is evolved, while the oil is passed to a still for the removal of motor spirit by distillation. The oil remaining after distillation (usually boiling above 170° C.) forms the "recycle oil," which is stored in tanks for recirculation through the plant as part of the raw material.

The residual gas leaving the high-pressure separator contains about 90% of hydrogen, and after scrubbing to remove the gaseous hydrocarbons it is recirculated through the converter.

Some difficulties in controlling the temperature were encountered in the first experiments, as the heat of reaction and the heat losses from the new plant were not precisely known. On a number of occasions excessive rises of temperature in the reaction vessel were recorded, and different expedients were adopted to overcome them. The most effective of these was to use a high proportion of hydrogen to tar in the raw materials supplied to the converter, so that by variation in the rate of hydrogen flow it became possible to maintain the reaction temperature within a few degrees of the desired level.

Although a number of mechanical troubles were at first met with, these were mainly of a minor character and were easily overcome. More serious were blockages in the pipe-lines, caused by the accumulation of sulphur and ammonium compounds, but these too were eventually overcome, and no difficulty was experienced in operating the plant for periods up to one month.

The report is largely concerned with the results obtained. The amounts and analyses of the materials produced under different operating conditions are given, and comparisons are made with the corresponding results from the small-scale converters. Certain conclusions clearly emerge. The operation of the plant has been very satisfactory and has shown that the results of treating low-temperature tar are similar to those obtained in small-scale experimental plants. The reasons for such slight differences as have been observed are understood, and it has therefore been unnecessary to continue experimental work on a larger scale, for the results from the small-scale plants can now be readily translated into terms of full-scale operation.

* Fuel Research Technical Paper No. 51, "Hydrogenation-Cracking of Tars." Part V. The Operation of a Semi-Technical Scale Plant. Published H.M. Stationery Office, price 1s. net.

Institution of Gas Engineers

Combustion Characteristics of Town Gas

Part IV—The Aeration Test Burner (Model B)

Extract from the 44th Report of the Joint Research Committee of the Institution and Leeds University

Communication No. 217

GENERAL INTRODUCTION BY THE LIVESEY PROFESSOR,
D. T. A. TOWNEND, D.Sc., PH.D., D.I.C.

In continuing its work on the combustion characteristics of town gas, the Joint Research Committee, under the Chairmanship of Mr. H. C. Smith, has been concerned with two problems. The first concerns the use of a specially constructed standard burner as an aid to works control of town gas quality; with such an instrument, some indication may be available of how day-to-day variation in the chemical constitution of any supply may affect the behaviour of appliances on the district it serves. The second relates to the question as to how far the indications of such a burner, arbitrarily expressed in terms of air requirement for a given cone-height, can be of service to appliance manufacturers as a criterion for testing purposes.

The Committee now recommends the use of a test burner for control purposes at all large gas undertakings. The original Aeration Test Burner (Model A) and precautions regarding its maintenance and use were considered in the 42nd Report. During the past year an improved test burner (Model B) has been developed and, in view of the possible difficulties which may arise during the present state of emergency owing to changes in the composition of town gas, this model is described in the present Report. A brief summary of such representative experience as is available regarding the use of A.T.B. Numbers in the control of town gas has also been prepared at the Watson House laboratories and is incorporated.

In addition to completing this investigation of the original and the newer Aeration Test Burner, Mr. J. W. Wood and his assistant, Dr. A. H. Eastwood, have investigated the quantitative relationship between the A.T.B. Numbers of various town gases and their behaviour in appliances. Up to the present a number of gases of 500 B.Th.U. per cu.ft., but containing different hydrocarbons, have been tested; the range of A.T.B. Numbers so far dealt with, however, has been inadequate to justify the drawing of general conclusions. The Committee has suspended this investigation for the time being and the publication of the results obtained to date, which form an Interim Report, remains in abeyance pending its further extension.

INTRODUCTION AND SUMMARY

The work carried out on the combustion characteristics of town gas during the past year falls into two main sections: (i) the further examination and development of the Aeration Test Burner, and (ii) experimental work to establish the relationship between the A.T.B. Number of town gas and its behaviour in domestic and other gas appliances.

During the present state of emergency it is probable that changes in the composition of town gas will occur. This will be caused among other things by efforts to meet increased loads, benzole-washing, failure to obtain usual supplies of gas making coals, and deterioration of plant. It is important that the combustion characteristics of town gas should not be altered to such an extent as to reduce efficiency in utilization and give rise to complaints from consumers.

The chief types of trouble to be anticipated are inadequate thermal delivery, and, with burners working on the Bunsen principle, noisy operation and tendency to back-fire; and in this connexion it is clear that an instrument capable of indicating any approach to conditions unfavourable to the satisfactory operation of gas appliances, even if approximate in its indications, will be of value in enabling Gas Undertakings to avoid considerable difficulties.

It is believed that the Aeration Test Burner will meet this need, and the Committee has therefore decided to make known at once all essential information available concerning it. It is to be understood, of course, that the Aeration Test Burner merely supplements and does not displace the calorimeter.

A strict quantitative relationship has not been established, but, in general, trouble of the types mentioned may be expected if the A.T.B. Number of town gas falls by more than a stipulated amount below that for which appliances have been adjusted. Some idea of the permissible tolerance, deduced from the experiences of Undertakings already using the Aeration Test Burner, is indicated in the Report; and it would be advantageous for the larger Undertakings throughout the country to procure instruments and ascertain for themselves the lower safe limit of A.T.B. Number appropriate to local conditions.

Since the publication of the 42nd Report, Aeration Test Burner (Model B) has been developed,* and although working on precisely the same principle as Model A it has been greatly improved in mechanical detail, range, and permanence of calibration.

The empirically defined scale of the new burner differs materially from that of Model A and a conversion table is given in Table 2. For a number of reasons it has been decided in future to use the new scale for stating the combustion characteristics of town gas in terms of A.T.B. Number. It should be noted that small changes in A.T.B. Number are not always reflected quantitatively by differences in performance of gas appliances, and that for routine control of gas quality it is unnecessary and undesirable to employ fractions or decimals of an A.T.B. unit.

The Aeration Test Burner is at present manufactured by Alexander Wright and Company, Limited, London. As already indicated, burners of the older model may continue in service so long as they are in satisfactory condition, but new instruments and replacements should preferably be of Model B.

Experimental work upon the relation between the A.T.B. Number of town gas and its behaviour in ordinary appliances is in progress. So far a series of experiments has been made with a drilled boiling ring of an older type using gases of 500 B.Th.U. per cu.ft. in which the quantity and nature of the hydrocarbons have been varied. The range of A.T.B. Numbers covered has been too small to warrant conclusions on major issues concerning the significance of A.T.B. Number, and it is felt that a more informative and con-

* Originally Gas Light and Coke Company's Registered Design No. 830893. The Governor and Directors of the Company have kindly authorized the assignment of the rights in the design to The Institution of Gas Engineers in order that the burner might become available to the Industry generally.

clusive Report should be presented when the work has progressed somewhat further. An account of the experiments with the ring burner is therefore deferred pending the completion of the present investigation.

DESCRIPTION OF AERATION TEST BURNER (MODEL B)

Research Chemist: James W. Wood, M.Sc.Tech., A.I.C.

Research Assistant: A. H. Eastwood, Ph.D., A.I.C.

In Section VII of the 42nd Report of the Joint Research Committee* a general indication was given of proposed improvements in the design of the Aeration Test Burner, which can now be described in greater detail. It should, however, be made quite clear at the outset that the original principles of operation are retained, namely, that a carefully made Bunsen burner with fixed gas nipple is worked at a standard gas pressure and the air-shutter is adjusted to yield an inner cone of specified height. The improvements are all in mechanical detail and ensure greater accuracy, robustness and permanence of calibration.

Three sample burners were constructed for the Gas Light and Coke Company, and one of these was loaned to the Joint Research Committee, thus enabling independent examination and comparison with the older type of Aeration Test Burner to be made concurrently at Watson House and at Leeds. The burner is shown in Fig. 1 and consists of three main parts, the pedestal *A*, air-intake chamber *B*, and water-jacketed stem *C*, all rigidly fixed together.

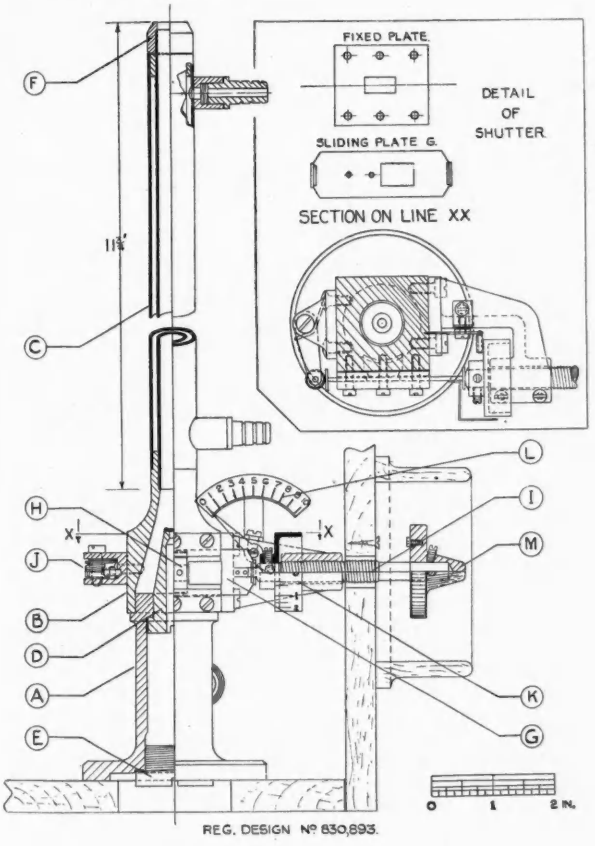


FIGURE 1.—*Aeration Test Burner (Model B).*

The small diaphragm governor differs in detail from that fitted to Model A. It shows a decided improvement in governor characteristics.

* *Trans. Inst. Gas Eng.*, 1938-39, **88**, 55.

Gas Nipple

The orifice through which the gas issues is of the same type and dimensions as that used in Model A, namely, a punched cylindrical hole 0.0390 in. in diameter in a German silver plate 0.008 in. thick. The discharge at 2.50 in. w.g. with saturated air at 60° F. and 30 in. barometer was 2.19 cu.ft. per hr. (The rate is determined as in the 42nd Report.†)

The orifice plate is spun into a brass fitting *D*, which secures the accurate placing, centering, and alignment of the orifice. Access is given to this fitting by the plug *E*, both being removable with a special tool. The orifice can thus be inspected, cleaned and replaced at any time. So far, this operation has been performed once—after the burner had been in use for three months—and upon replacement no appreciable disturbance of the calibration was observed.

The production and mounting of punched orifices with predetermined discharges and exactly similar discharge characteristics is not easy, and it is possible that the orifice plates will be replaced by Amal nipples, carefully inspected and adjusted for this purpose. The Amal nipple has a channel-type orifice about 3½ diameters in length.

Burner Stem

The burner stem and steatite head *F* are of the same diameter (0.404 in.) as in Model A, but the whole length of the stem is water-jacketed. Connexion between the side arms and the case is by rubber tubing, so that there is no possibility of pulling the stem out of alignment when fitting the water connexions external to the instrument case. The lower end of the parallel stem opens gradually into the conical air-intake chamber and no provision is made for adjustment of the air-flow either by use of a damper pin, or by screwing down the burner stem on to the nipple.

In Model A the greatest resistance to air flow was between the lower end of the burner stem and the tip of the nipple, where the clearance was about one-half the cross-sectional area of the burner stem, and required critical adjustment. In Model B, the minimum clearance is rather more than twice the cross-sectional area of the burner stem, and is not critical.

Air-Shutter

The air-shutter is of the slide-valve type. It consists of a brass plate *G*, provided with a rectangular opening $\frac{3}{8}$ in. × $\frac{17}{32}$ in., sliding over a fixed plate screwed to the front face of the air-intake chamber, the two plates being pressed together by the contact spring *H*. The faces in contact are ground true and flat and no lubricant is used. The fixed plate contains a very accurately cut rectangular opening 0.250 in. × 0.500 in.; the maximum opening is therefore very similar to that of Model A with the air-shutter opened one complete turn. The sliding plate is operated by an accurately made steel micrometer screw *I* of 20 t.p.i., and kept in contact with the inner end of the screw by a strong return spring and roller *J*. The drum *K* is numbered to show tenths of a revolution of *I*, which are read as A.T.B. units; half-units are also marked. The pointer and secondary dial, *L*, indicate complete revolutions of the micrometer screw, or tens of A.T.B. units. Pinch-screws are provided to take up wear on the screw *I*, which is operated by a guarded knob *M*, outside the instrument case.

Closure of the shutter and zero setting can be readily checked to 0.1 unit by direct visual inspection, no special illumination arrangements being required as with Model A: occasional dusting with a camel hair brush will keep the shutter opening clean.

Three methods were devised for checking the closure of the shutter, only one of which need be described. It consisted in closing the normal gas inlet to the instrument, supplying air through a $\frac{1}{10}$ cu.ft. experimental meter to the top of the burner stem at a steady pressure, and noting the flow for various settings of the air-shutter.

Performance

As the gas rate and standard cone height (19 mm.) are the same for both Models A and B, and the cone height is fixed in identical fashion, it might be assumed that no improve-

† *Ibid.* 1938-39, **88**, 47, 51.

ment in accuracy of reading had been effected; there are, however, gains in several directions.

The improved governor and glazed front to the instrument case give a steadier cone. The higher attainable primary air-gas ratio enables gases of higher calorific value to be dealt with on Model B than on Model A. Further, the sensitivity of Model B in the region above a calorific value of 500 is materially improved. This is shown in Table 1, cols. 6 and 7. The cone height can easily be set to ± 0.5 mm. of the standard height.

TABLE 1.—*Comparisons of Burners A 124 and B 161*

Gas Ref. No.	Approx. Calorific Value, B.Th.U. per cu. ft.	Specific Gravity, Sat. Air = 1·00	Reading on A 124, Corrected	Reading on B 161	Sensitivity = mm. Change in Cone Height per Division on Instrument Dial	
					A 124	B 161
1	2	3	4	5	6	7
166	387	0·554	41·8	20·4	1·93	2·40
164	470	—	65·6	36·7	1·00	1·56
165	500	0·451	74·2	42·3	0·66	1·25
168	525	0·490	89·5	49·1	0·45	0·91
167	550	0·488	117·0	56·8	0·15	0·67
163	615	—	>200	90·0	—	0·30

Key to gases used:

No. 163 Rich coal gas.
164 Gas from steamed vertical retorts.
165 Gas from steamed vertical retorts 94.2 per cent + natural methane 5.8 per cent.
166 Gas from steamed vertical retorts 82.5 per cent and air 17.5 per cent.
167 470 town gas 82.5 per cent + natural methane 17.5 per cent.
168 470 town gas 88.0 per cent + natural methane 12.0 per cent.

Actually, care is required in the interpretation of the foregoing sensitivity figures, for if the ratios of corresponding entries in cols. 4 and 5 are taken, it will be seen that the value of a division on the scale of Model B is roughly twice that on Model A.

Burners of Model B have been very carefully calibrated at Watson House against a master burner of Model A (No. A 102). The results show that the calibration is affected to some extent by the type of gas used,* but that the deviations are not so great as to prevent a mean conversion curve of reasonable accuracy being drawn. This is reproduced in Figure 2.

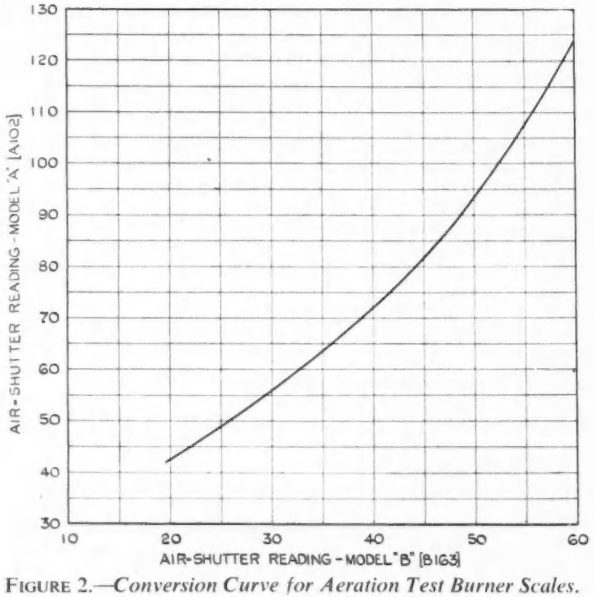


FIGURE 2.—*Conversion Curve for Aeration Test Burner Scales.*

Calibration and Establishment of Scale

The scale of the Aeration Test Burner is empirical, and, as in the case of the thermometer, working instruments can probably be calibrated most satisfactorily by direct comparison with carefully preserved standard burners.

For the time being, the scales of B 161-2-3 have been empirically fixed by the dimensions of the burners, and are in fair agreement. It would seem that the most practicable way of checking and reproducing the scale is to determine

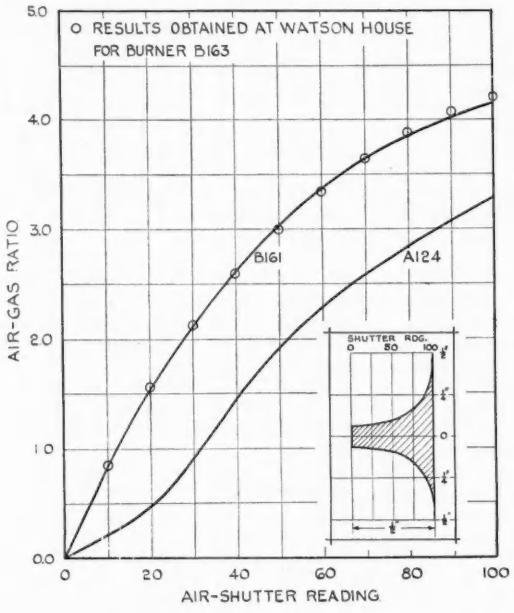


FIGURE 3.—*Aeration Curves for Aeration Test Burners using Gas of* 0.45 *Sp. Gr.* (*Air* = 1).

the air-gas ratios corresponding with air-shutter settings at a sufficient number of points for gas of a stipulated specific gravity.

The air-gas ratio—shutter-setting curve has been determined for B 161 at Leeds by chemical methods, and for B 162 and 163 at Watson House by physical methods. The results, represented by Figure 3, are in good agreement. The corresponding air-gas ratio curve for A 124 is reproduced from the 40th Report of the Joint Research Committee* for comparison. The higher attainable air-gas ratio with Model B is at once evident.

It would be possible, by giving the aperture in the back plate of the air-shutter the shape and dimensions indicated by the inset to Figure 3, to secure a straight-line relationship between air-gas ratio and air-shutter readings for gas of a selected specific gravity, if this were considered desirable. Such a relationship would still be empirical, but less so than the existing relationship.

The alternative plan of calibration against a number of gas mixtures of specified composition has been abandoned on account of difficulties in preparing the gases in a state of purity and making up the mixtures with sufficient precision.

On the other hand, testing at intervals upon a cylinder of gas of constant composition to see that calibration was being maintained is practicable. No binary mixtures of the gases, hydrogen, methane and nitrogen were found to be suitable for this purpose, but a ternary mixture of hydrogen 35 per cent., natural methane 39 per cent., and air 26 per cent., with an approximate A.T.B. Number of 80 (old scale) will suffice (specific gravity 0.52; calorific value = 490 B.Th.U. per cu.ft.). It has been found desirable to exclude carbon monoxide from such mixtures owing to the disturbing effect of iron carbonyl which sometimes forms on prolonged storage in steel cylinders.

* See also *Trans. Inst. Gas Eng.*, 1938-39, **88**, 53, 54.

* *Trans. Inst. Gas Eng.*, 1937-38, **87**, 149.

NOTE: The scale on which A.T.B. Numbers are to be quoted in future is that of the new Model B.

THE CONTROL OF TOWN GAS WITH RESPECT TO A.T.B. NUMBER DURING NATIONAL EMERGENCY

(Contributed by The Gas Light and Coke Company, Watson House)

Many Gas Works have to face the possibility of wider variations than normal in gas composition and calorific value and, perhaps, permanent lowering of calorific value. An Aeration Test Burner should provide the works engineer with a useful check on quality. Detailed recommendations obviously cannot be made for each type of gas, but after a little experience with the burner, engineers should be in a position to know that if the A.T.B. Number varies by more than a certain percentage either way from an average figure trouble may be experienced on the district. The effect on the Aeration Test Burner of lowered calorific value, variation in proportion of water gas and inerts would thus provide a useful guide during those periods when variation in manufacturing conditions is unavoidable. Too great a fall in A.T.B. Number, leading to lighting back, is obviously to be avoided if at all possible, as the expense involved in adjusting appliances may be very great.

TABLE 2.—*A.T.B. Numbers of Some Typical Gases and Mixtures (Haffner)*

Gas.	Calorific Value, B.Th.U. per cu.ft.	A.T.B. Number
1	2	3
Coal gas	565	220+
Carburetted water gas	500	49
Carburetted water gas	450	39
Blue water gas	295	16
Producer gas	126	12
Coal gas	565	220+
Coal gas + waste gas	500	82
Coal gas + producer gas	500	79
Coal gas + blue water gas	500	73
Coal gas + carburetted (422) water gas	500	59
Coal gas + carburetted (461) water gas	500	53
Debenzolized coal gas + producer gas	500	87
Straight coal gas + producer gas	500	79
Debenzolized coal gas + blue water gas	500	78
Straight coal gas + blue water gas	500	73
Debenzolized coal gas + carburetted water gas	500	60
Straight coal gas + carburetted water gas	500	53

The following is a short summary of the effects of possible changes in composition:

(*a*) The main danger is from a fall in A.T.B. Number, leading to lighting back of appliances and noise. A rise in A.T.B. Number may cause a fall in efficiency and also incomplete combustion, but will not normally put the appliance completely out of action.

(*b*) The A.T.B. Numbers of some typical gases are given in Table 2.* It should be emphasized that A.T.B. Number is not an additive property, and it is in general impossible to deduce the A.T.B. Number of a mixture of two gases from the A.T.B. Numbers of the constituents.

(*c*) A fall in calorific value is normally accompanied by a fall in A.T.B. Number. The effect on A.T.B. Number of adding water gas, etc., to coal gas is discussed by Haffner.*

Some of Haffner's results are shown in Table 2. To obtain a resultant town gas of given calorific value, waste gas gives the least fall in A.T.B. Number, then producer gas, B.W.G., and lastly C.W.G., the fall in A.T.B. Number increasing with the degree of carburetting. The higher the calorific value of the diluent gas the greater is the effect on A.T.B. Number, since with increasing calorific value of the diluent more must be added to reduce the calorific value of the resultant town gas to the desired figure. However, with diluents of nearly the same calorific value other factors must also be considered.

Similarly, there is a smaller fall in A.T.B. Number if the coal gas is debenzolized before dilution to the desired calorific value.

* Haffner, A. E., *Trans. Inst. Gas Eng.*, 1938-39, **88**, 1454.

TABLE 3.—*Permissible Variation in A.T.B. Number of Town Gas with Different Appliances*

Appliance	Phenomena Observed when A.T.B. Number is Lowered	Percentage Drop in A.T.B. Number to Produce this Effect	Phenomena Observed when A.T.B. Number is Raised	Percentage Rise in A.T.B. Number to Produce this Effect
1	2	3	4	5
Gas Fires:				
(*a*) Single-hole flame ports and high aeration. (1936-1938 models.)	Flash back to some of the disks when ignited cold.	13–20	Poor appearance and tendency to incomplete combustion. (Depends on radiants.)	Over 20 (modern radiants).
(*b*) As (*a*), another maker (1938).	(i) Flash back when ignited cold.	27		
	(ii) Light back at ½ rate when turned down.	20		
	(iii) Light back at ¼ rate.	13		
(*c*) Single-hole flame ports, lower aeration. (1935 and earlier.)	Flash back when ignited cold.	40		
(*d*) Multi-hole flame ports and high aeration. (1936-1938 models.)	(i) Shrieking sound on first igniting (cold).	20–27	Poor appearance and tendency to incomplete combustion. (Depends on radiants.)	High
(*e*) Bowl fire (1935 pattern.)	Flash back when ignited cold.	13		
Lamps:				
(*a*) Domestic burner (1936 test.) ("Channel-grid" nozzle).	Reduced light output (20 per cent.).	27	Reduction in light output (20 per cent).	10
(*b*) Five-light street lamp of conventional design. (1936.)	Flickering, and fire back to disks on some nozzles.	13	do. do.	—
(*c*) Modern 4-light lamp (1939.)	Partial light back to disks when hot.	28		
(*d*) Modern 12-light lamp (1936.)	do. do.	21–24		
Drilled Ring Burners:				
(*a*) Simmering burner on hot plate. (About 1934.)	Tendency for flame to flash back or blow out in draught when turned low.	27	Tendency to incomplete combustion.	20
(*b*) All burners on modern hot plate. (1938.) Including spreading-flame type.				
(*c*) Wash copper (About 1935.)	Flash back in draught when turned down.	40	do. do.	Very high
Gas Irons:				
(*a*) Old type (Pre-1935.)	Flash back when moving	21	Incomplete combustion when moving.	10

(*d*) W. F. Thorne and W. S. Stredwick† are able to obtain a town gas of constant A.T.B. Number with different proportions of water gas by varying the calorific values of both the coal gas and C.W.G. to suit the amount of water gas used. Their formula is not directly applicable to other manufacturing conditions, but very likely a similar formula could be found experimentally for any given set of conditions.

(*e*) The effect of C.W.G. on A.T.B. Number can be reduced by modifying the technique of carburetting, e.g., by cracking of oil in the generator so as to give a lighter gas containing more hydrogen.§

Permissible Variation in A.T.B. Number of Gases

It is not possible to lay down definite limits within which change in A.T.B. Number is permissible, as this depends to such an extent on the kind of appliances in use, the general conditions on the district, and the nature of the gas supplied.

Some indication of the limits for 500 C.V. gas may, however, be obtained from the figures given by L. T. Minchin in the Discussion on the 40th Report of the Joint Research Committee* and some more recent results supplied by the Gas Light and Coke Company.

The permissible variation was originally ascertained in A.T.B. units for gas with an average A.T.B. Number of 75 on the "A" Scale. In view of the introduction of the new "B" Scale and the fact that the average A.T.B. Number of gases in other districts may be greater or less than 75, it was decided to express the tolerances in cols. 3 and 5 of Table 3, as percentages of the A.T.B. Number of the gas for which the appliances were adjusted.

It should be emphasized, however, that a great deal depends on the character of the initial setting, and in districts where it has always been the practice to set appliances to a longer cone height than that recommended by the makers, a greater lowering of the A.T.B. Number will naturally be permissible.

THE A.T.B. NUMBER OF LEEDS TOWN GAS

Some idea of the nature of the fluctuation of the A.T.B. Number of the gas sent out by a large Undertaking can be formed by the following information relating to Leeds.

Results of the daily examination of the A.T.B. Number of the gas distributed from one Works in Leeds over a period of three months were summarized in Section X of the 42nd Report of the Joint Research Committee. These observations have now been extended to cover a total period of six months, and a further set of observations has been made at the other Leeds Works, where the carbonizing plant is of a different type. The results are made known by permission of Mr. C. S. Shapley, Engineer and General Manager of the City of Leeds Gas Department.

† *Gas J.*, 1938, **222**, 368.

§ *ibid.*, 1939, **227**, 549.

* *Trans. Inst. Gas Eng.*, 1937, **87**, 208.

It should be repeated that the gas making process throughout the period in question was controlled in the normal manner at each Works to produce gas of the declared calorific value for Leeds, namely, 470 B.Th.U. per cu.ft., and no conscious effort was made to work to a constant A.T.B. Number.

TABLE 4.—*Variation in A.T.B. Number of Leeds Town Gas*

	Mean	Maximum	Minimum	Difference between Maximum and Minimum	Percentage of A.T.B. Readings within ±2° Units of Mean
1	2	3	4	5	6
Meadow Lane Works, June to December, 1938	62·7	69·6	57·6	12·0	55
New Wortley Works, January to March, 1939	66·7	72·4	60·9	11·5	79
Carburetted Water Gas†	44·2	—	—	—	—

° This range is selected for convenience and it is not suggested that it is a recommended or maximum permissible range for good works control.

† Calorific Value, 474 B.Th.U. per cu. ft.; Specific Gravity, 0·65 (air = 1·0).

The gas at the Meadow Lane Works is produced by steaming in West's 33- and 50-in. retorts and is partially washed for benzole. The output is supplemented as required by carburetted water gas, calorific value, 470 B.Th.U. per cu.ft. The gas at the New Wortley Works is produced in horizontal and inclined retorts washed for benzole and brought down to 470 B.Th.U. by the addition of producer gas.

The principal differences in the two supplies are in the CO, hydrogen and nitrogen contents.

The overall variation in A.T.B. Number of the two supplies was about the same, namely, ±6 units, but the unexpected result that the gas at Meadow Lane was apparently less uniform than that at New Wortley (See Table 4, col. 6) and that the uniformity was less than had been indicated in the 42nd Report,* called for a closer inspection of the figures, which was made by statistical methods.

The increased fluctuation in A.T.B. Number of the town gas sent out from the Meadow Lane Works, as compared with the results given in the 42nd Report, is due to the intermittent use of carburetted water gas and not to less uniform gas production in the retort house. The effect of adding 15 per cent. of carburetted water gas was to depress the A.T.B. Number by approximately 5 units.

Since the foregoing tests were made, carburetted water gas has been boosted on a few occasions from the Meadow Lane to the New Wortley Works at Leeds. The observations are not numerous, but the effect was to lower the A.T.B. Number of the gas sent out from New Wortley by about 5 units. This lowering of A.T.B. Number by the addition of carburetted water gas has been observed in other places and is apparently general.

Northern Ireland Gas Undertakings Bill

In the Ulster Commons, Mr. J. M. Andrews, Minister of Finance, in moving the Second Reading of the Gas Undertakings Bill, said it was a short and simple Bill of a non-controversial nature designed to remove two anomalies affecting gas undertakings.

The first provision allowed officers of a gas company constituted under a special Act of Parliament to be appointed to the board of directors, and thus brought Northern Ireland into line with directors in Great Britain. Secondly, the Bill qualified the procedure to be followed by local authorities making application for statutory powers with regard to the supply of gas.

It was desirable that the passage of the Bill should be expedited in order to facilitate the internal administration arrangements of an important public utility undertaking. If one of the directors of a company was serving with the Colours while two others were unable to act owing to illness, the powers proposed would enable the manager to be appointed to the board of the undertaking.

The Second Reading was passed, and on later days the remaining stages went through.

Light in the Darkness

One effect of evacuation and the blackout has been greatly to increase the use of educational films. Many of the city teachers, who have been evacuated, have taken their classroom projectors with them, and some of the deficiency in school equipment is being met by the increased use of the film in the classroom.

But the film showings have not stopped there. These evacuated schoolmasters have been gathering adult audiences together in the schools and church halls in villages far from the public cinemas, and there the films are being run again in the evenings. There is as yet no official plan to supply schools and adult evacuees with these "non-theatrical" films, but a number of film libraries, on their own initiative, are providing on request as many films as they can.

The Gas Industry library, which serves a large educational audience in peace time, is an example. This library, which contains many outstanding documentaries, including the famous "Nutrition" and "Housing Problems" films, has now issued a new pamphlet listing some 25 films. These are available, free of charge, on application to the Film Officer, Gas Industry House, 1, Grosvenor Place, S.W.1.

Experiments on Gas Manufacture

Written Contributions on Mr. Fife's Paper to the North British Association

Mr. **H. A. Aitken** (the President) wrote: We are indebted to Mr. Fife for the excellent Paper he prepared for delivery to the September Meeting of the North British Association of Gas Managers. The subject chosen is one which is of considerable interest and value coming as it does from a man of wide experience in the control of an important gas undertaking and one having had intimate association with various smaller works in his district. Many engineers to-day argue that the salvation of the Gas Industry is for the smaller works to be grouped and supplied from a larger undertaking. While many advantages would acrue it will take a long time before this can be economically accomplished. In the meantime, the smaller works must put their house in order—and herein lies the value of Mr. Fife's Paper.

He considers, and I fully agree, that the carbonizing plant for the small works must be just as flexible and capable of regulation to give the requirements of variation in gas demands and, at the same time, keep the quality of gas uniform as in the case of larger installations. Mr. Fife, on this point, touches upon the very important research accomplished over the past several years by the makers of gas appliances, and it behoves us to follow up this excellent service by supplying a commodity upon which the consumer can rely at any time of the day or night. It may be said that difficulties arise in the smaller works in keeping track of the composition of the gas by reason of lack of instruments; but this need not be an obstacle, because there are many dependable instruments on the market to-day which can be purchased at a reasonable price and which are simple to operate.

Mr. **Fife,** in reply, thanked Mr. Aitken and his other friends, who had so kindly contributed to the written discussion, which the unfortunate cancellation of the St. Andrew's function rendered necessary. Continuing, Mr. Fife wrote: Mr. Aitken reminds us that the grouping or pooling of resources of the smaller gas-works, or even their linking up with larger undertakings, would assist in solving many of their economic problems. There should, of course, still be very many undertakings left out in isolated districts where a simple or more economic gas manufacturing process would prove a blessing in the face of rising costs and keen competition. I feel that while manufacturers of gas-works plant have been making praiseworthy efforts towards fulfilling this want, the small works are still awaiting the arrival of a simple and reliable process to give results comparable with vertical retort practice. I always think that the Gas Manager who is responsible for the small works is to be congratulated, and has reason to be proud of carrying on a healthy business under most adverse and discouraging conditions.

A Matter for Unremitting Attention.

Mr. **R. J. Gavin** (Melrose) wrote: The question of the production of the cheapest possible therm embodied in a gas of unvarying C.V. and of uniform characteristics, pressure, and specific gravity is one that ought to claim the unremitting attention of all Gas Engineers but especially of those in smaller works where there is, of necessity, less technical and chemical control of the carbonizing processes. For this reason I welcome your Paper and the figures you give which were obtained in practical working and not in the laboratory.

Your table of comparative costs is very interesting, and it is remarkable that the net cost per therm with the total gasification plant is the same as with verticals. In this connexion, how would labour costs compare with the two systems?

The calorific value, 380 B.Th.U., is rather low if a district is handicapped with small mains and services, and the cost of carburetting with oil would appear to be prohibitive. Would it not be practicable to fit an auxiliary producer to the plant to bring the super-imposed vertical retort to a carbonizing temperature and thereby crack the hydrocarbons into permanent gases? This would, of course, reduce the coke for sale figure, but it would produce a more easily distributable gas—*i.e.*, one with a higher C.V. The amount of tar produced from Ayrshire coal carbonized in verticals is very high at 21 gallons per ton. We produce a like figure in Kirkcaldy from Fife coals, but it was exceptional, and I think 14 to 16 gallons per ton is the average figure on the East Coast. Do you attribute this high figure to carbonizing conditions or to unusual condensation practice? The reason I ask is that the tar figure in your comparative results is the only one where there is a marked divergence. There is, of course, a difference in coke for sale, but I suppose that could be adjusted by the way in which the plant was run.

Mr. **Fife,** in reply, wrote: Regarding labour costs, the operator on the plant which I described is fairly constantly engaged while on production; but, notwithstanding this, one man could easily manage the operation of at least two plants, provided he had mechanical means of elevating the coal to a suitable overhead hopper and also, of course, a reasonably convenient method of disposing of the residual coke. An effort was made, which I understand was attended with a considerable amount of success, to operate this plant by automatic means. The accomplishment of this would of course, allow the attendant some time for other duties. It is somewhat difficult to compare the labour costs involved in operating this small plant alongside that of a vertical setting. For example, two operators per shift could, with modern verticals, carry out the work required on a 2 million per day plant, whereas the plant which I have described was capable of producing only 150,000 cu.ft. per day.

With reference to Mr. Gavin's question regarding the fitting of an auxiliary producer to the plant, I doubt very much, taking into consideration the circular shape of the retort and also the speed of travel of the fuel through the retort, whether this would serve any useful purpose. One of the features of this plant is that it can be put out of operation or started up quickly, and if the plant were out of action for hours at a time the producer would also require to be damped down during this period.

The only method, with which I am acquainted, of assisting the carbonization of the coal in a single-stage plant is that applied by Messrs. Humphreys and Glasgow in their complete gasification process—*i.e.*, the introduction of a hot gas fan. This fan is ued to circulate a proportion of the hot gases back through the generator in order to convey additional heat which assists in carbonizing the coal. I am afraid the introduction of an auxiliary producer with its attendant costs would tend to nullify any advantages which might be claimed for the plant as described.

The tar figure which I quoted, 21 gallons per ton of coal, has been obtained (varying between 20 and 21 gallons) since the start of our Glover-West vertical installation. It may be partly accounted for by the type of coal used and by the fact that steaming to 410 B.Th.U. quality of gas is practised, necessitating high temperatures.

A Method of the Future.

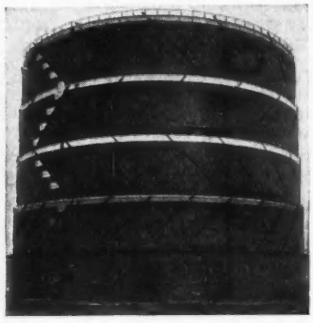
Mr. **A. Jamieson** (Johnstone) wrote: The paper contributed by Mr. Fife undoubtedly draws attention to a method of gas manufacture about which more is likely to be heard in the future. It is unfortunate that more details of the plant working as a total gasification unit are not available, as sooner or later such methods of carbonization must be adopted with a view to removing the uncertainties of the residual product markets from the economics of gas manufacture.

The test figures deal mainly with the smaller plant, but it might be of interest if Mr. Fife could say if the temperatures used in both were similar, as this might explain the presence of coal among the coke. The results when making 414 B.Th.U. gas are exceedingly good, especially with about 8 cwt. of coke per ton of coal available for sale, and I have no doubt such figures will give many Engineers using modern vertical retorts serious food for thought. I was particularly interested in the composition of the gas compared with that from modern plant at Kilmarnock, the inert contents being approximately 33⅓% less, and this undoubtedly would be a recommendation for such plant in itself.

It is unfortunate that Mr. Fife did not give more space to the question of throughput and flexibility of the plant, but I have no doubt it will be possible for him to supply this, as such information would have been most valuable to the Engineers of smaller works with limited storage.

Mr. **Fife,** in reply to Mr. Jamieson's question regarding temperatures of the generators, wrote: I would draw attention to the fact that the design of this plant is such that the blast is essentially introduced through nostrils built in the generator sides and not under the grate as in many other complete gasification plants. With the bigger plant which I described there appeared to be difficulty in forcing the blast through the dense mass of fuel into the centre of the bed. In consequence of this, a uniform temperature could not be obtained throughout the generator of this big plant, and the cool central core of fuel seemed to persist at all times, causing the irregularities which I described in the operation of the plant. This led me to conclude that there must be a workable limit to the single stage type of generator.

Mr. Jamieson comments on the low inert content of the gas produced by the single-stage generator. This, I think, must be due in a measure to the fact that the operation of gas-making is always carried out under pressure conditions, and therefore the liability to pull inert gases is eliminated. With reference to flexibility, it might be claimed for this plant that gas-making, once the plant is heated up, can be discontinued or started up within a few minutes. There is also a considerable flexibility in control of the plant in so far as quality of gas is concerned, because the extraction of coke, the steam pressures, and blast can all be adjusted through a wide range.



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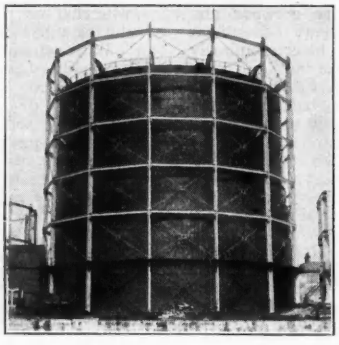

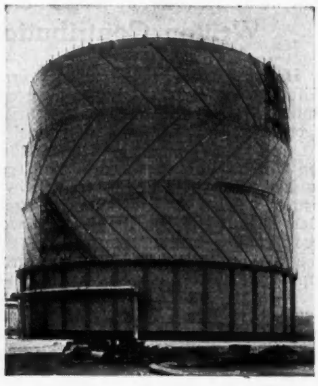

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Economics of Benzole Recovery

Further Contribution to the Discussion on Mr. Rea's Paper to the North British Association

Mr. D. D. Burns (Secretary and Commercial Manager of the Glasgow Gas Department) wrote: I have been following with interest the correspondence in the "GAS JOURNAL" on the "Economics of Benzole Recovery," but was surprised to read in the last issue the remarks of both Mr. Nicol Baird and yourself regarding the incidence of taxation.

It would appear to me that a local authority which is not allowed to make a profit, but must utilize surpluses to reduce charges, and, conversely, must increase charges to meet deficits, is in a different category from a company. Obviously, a local authority undertaking is assessed not on profit but on revenue used to meet inadmissible expenditure for taxation purposes, less certain allowances such as tenants' plant and the Rating Act (1926) deduction in the case of local rates valuation and profit on supplies to other corporation departments in the case of income tax. This would be the position over a period of years where revenue and expenditure should equal each other approximately.

Consequently, I do not think that the "profit" on your benzole production is the basis for your income tax and local rates calculation, but that such "inadmissible expenditure" which arises in connexion with your benzole plant must be the basis. This in the case of income tax would be "sinking fund," and in the case of local rates "sinking fund plus interest," less deductions under the Rating Act, 1926, and allowances for tenants' plant. You will observe that the incidence of taxation is not so heavy as you appear to think, and, consequently, you can still show a "profit."

Mr. A. C. Rea, in reply, wrote: Your differentiation between the amount of tax which is payable between company and corporationed owned plants would indicate that this operates in favour of the latter. In my reply to Mr. Baird's observations I adopted our standard method of assessing income tax and rates. The figures are calculated on the 1938-9 account, which showed a gross revenue of £15,601, with a credit balance of £2,728. By particularizing on this year the proportion of taxes is higher than the average, because, as you observe, over a period of time there can be no such thing as a corporation undertaking showing a "profit." If a deficit had resulted from the year's working then the actual profit on the benzole plant would be increased by the proportional difference in gross profit.

East Surrey Co-Partnership

War-time conditions necessitated the abandonment this year of the entertainment which has usually followed the annual meeting of the East Surrey Gas Company's Co-partners, and an afternoon meeting was decided upon. This was held at the Club Room at the Company's gas-works, Redhill, and the large attendance was favourably commented upon by Mr. W. Lees Stenning, J.P. (Chairman of the Company), who presided. He was supported by Messrs. R. Heath Mew (a Director), J. R. W. Alexander (General Manager), Horace Long (Secretary to the Company and Hon. Secretary to the Committee), Ernest Scears (Chief Engineer) and Arthur Tennant (Sales Manager).

The Committee's annual report stated that bonus and interest for the year amounted to £2,812, and £956 was deposited on Savings Account. Co-partners had invested during the year in the capital of the Company £1,918. Investments now totalled £20,760, divided among 255 co-partners. Messrs. F. H. G. Higton, F. W. L. Sharp and E. W. Wilson had been elected as Directors' nominees on the Committee.

Moving the adoption of the Committee's report and the statement of accounts, the Chairman remarked that the amount of bonus and interest paid during the past year showed a substantial increase. The co-partners' bonus was at the same rate as the shareholders' dividend. For the past seven years this had been maintained at 6%, but the statutory sliding scale operated to reduce the rate as the charge for gas increased. Interest paid during the year amounted to £136. As compared with ten years ago this showed an increase of £90. Since the introduction of the Savings Account some 17 years ago, the total cash deposits had grown to £12,000, or an average of about £700 per annum. To-day there were 289 co-partners compared with 201 in 1929.

Mr. J. R. W. Alexander said the employees of the Company had learnt with gratification of the decision of the Directors to make every possible effort to reinstate permanent employees at the conclusion of hostilities. The Company had gone a step further to mitigate the lot of those left behind, and whose fortitude was beyond all praise, by arranging for certain grants to be paid to families of those married before the war who suffered, despite generous Government allowances, by reason of the absence of the breadwinner with the Navy, Army or Air Force. Nor was that all. Further evidence of the interest of the Board in the welfare of those serving with the Forces was afforded by the decision that, as during the last war, a Christmas parcel should be sent by the Company to men so absent. This much appreciated arrangement was being supplemented by the employees, for it was hoped to inaugurate a fund to enable parcels to be sent regularly to those on Service.

Speaking of the maintenance of service, Mr. Alexander said conditions to-day, particularly of black-out, made the task of employees of the Company even more difficult than usual, but it would be their endeavour, given co-operation and understanding from consumers, to maintain a cheerful and efficient service. The extensive defence organization of the Company was almost entirely maintained on a voluntary basis, with a view to avoiding expense, and to eliminate the demoralizing effect of standing-by with nothing to do. In conclusion, he congratulated those whose training and study, mostly at night, was being recognized by the award of prizes and certificates. They would never regret the hours they had devoted to the pursuit of qualifications material to their job.

The Chairman then presented long service certificates, cricket prizes, and certificates and prizes in connexion with the technical and ambulance classes.

The Chairman referred to the Secretary's half-century of service, and after the meeting Mr. Long made a private presentation to his senior assistant, Mr. Heaysman, to mark his 47 years' assistance.

Athletic and Social

Clayton and Allied Firms' Sports Association

Under the Chairmanship of Mr. LEONARD HARTLEY, about 150 members and guests recently attended the Annual Dinner of the Sports Association connected with the firm of Clayton, Son, & Co., Ltd., Gas and Constructional Engineers, and its allied firms—Deightons Patent Flue and Tube Co., Ltd., Goodall, Clayton & Co., Ltd., and the Yorkshire Patent Steam Wagon Co., of Hunslet, Leeds.

Responding to the Toast "The Allied Firms and the Sports Association"—proposed by Mr. J. J. BAINES, who recently retired from the Directorate—The Chairman emphasized the spirit of goodwill which existed between the Directors and Employees. He also expressed his appreciation of the fine spirit of sportsmanship which existed between all employees of the firms—a spirit of especial value at this time when a maximum effort was called for.

Mr. S. C. THOMSON proposed "The Guests," to which Mr. I. SHUTTLEWORTH (President of the Leeds and District Cricket League) responded. He praised the Association on the efficient manner in which the organization was run, and congratulated the Cricket Club on having received promotion to the Senior Division of the League.

The Honorary Treasurer of the Sports Association—Mr. J. RATHMELL—reported that the Association was very sound financially and otherwise. Additional land had been secured to double the size of the sports field, a new cricket flat had been laid, and the erection of a new pavilion was under consideration. The angling, bowls, cricket and golf sections had had a particularly successful season, the membership of each section having increased. Six angling matches had been held, with an average of about 40 members competing at each. The cricket section had done well. The first team won the Championship of the Leeds and District Cricket League (A Division), and had been promoted to the Senior Division; while the Second Team, although finishing the season about half-way up the League Table, reached the final of the Yorkshire Central League Cup Competition. The activities of the darts, swimming, and table tennis sections had been interfered with owing to the outbreak of war and the resultant black-out.

The children of the members had been adequately provided for by the entertainment section, over 200 being taken to Belle Vue Gardens, Manchester, on July 15, following the "field day" on July 8. It was regretted that existing conditions would not allow the usual childrens' Christmas party to be held, but arrangements were now being made whereby the children would be remembered at Christmas.

The trophies, together with replicas and prizes, in connexion with the various sections, were presented to the winners by Mrs. HARTLEY.

COMPANY MEETING

Oriental Gas Company, Ltd.

The Annual General Meeting of the Oriental Gas Company, Ltd., was held at the London Office of the Company, Finsbury House, Blomfield Street, E.C.2, on Thursday, November 30, 1939—Mr. B. W. ELLIS, A.M.Inst.C.E. (Chairman of Directors), presiding

The SECRETARY (Mr. A. W. Hentsch) read the notice convening the meeting, together with the Auditors' report.

The CHAIRMAN, in moving the adoption of the Directors' Report and Statement of Accounts for the financial year ended June 30, 1939, said: Before commencing the business of the meeting I have to inform those of you who may not yet be aware of it, of the temporary removal of the Company's Office out of London. Following the example of a large number of other Companies and firms in the City this was decided on shortly before the outbreak of War. Operations are now conducted from my own house in Berkshire. The staff are in quarters nearby, and the only charges on the Company will mainly be towards the increase in their expenditure occasioned by the move. The Board, however, continue to meet here in London. I am now able to face you to-day more confident as regards the safety of your property; my action has had the approval of my colleagues and I hope will meet with yours.

Since our last meeting the Directors have had a very valuable and welcome addition to their number in the person of Mr. George Evetts. He has been our Consulting Engineer for many years and, on his retirement from active practice, accepted our invitation to join the Board. He visited and reported on our works in Calcutta ten years ago, and possesses an intimate knowledge of them and our distribution system, and we and you are most fortunate in obtaining his services, being as he is in technical and administrative practice among the leading men of the Industry.

Now to review the accounts. There is no change in the capital account. In the Revenue Account, under Manufacture we have carbonized 2,027 tons more coal at an increase in cost of £1,133. Salaries and Wages are higher by £335 and £230 respectively. Purification is up by £320 as we purchased new oxide. Repairs and Maintenance show an increase of £3,220. Of this, General Maintenance is higher by £530, and the balance of £2,690 is Capital Expenditure but charged to Revenue. In Distribution salaries are down £80. In Repairs of Mains and Services we show an increase of £3,670. Of this, £2,044 is Expenditure on new mains, but at the same time ordinary repairs have been heavier. Meters are up by £314 owing to the growth of our business, but Fittings are lower by £100. In all, Distribution costs are £3,800 higher. Public Lamps are substantially the same figure. Rents, Rates, and Taxes are higher by £3,100, due to increased Income-tax, National Defence Contribution, and a full year's rent on our new Head Office in Calcutta. This is an ever-growing item of expenditure, and we must anticipate further heavy increases. Under Management, London Salaries are £270 and Calcutta £27 lower. General Charges are £130 lower, and the total for Management shows a drop of £400. Bad Debts are lower by £23. Superannuations and pensions are higher by £1,400, most of which increase represents the retiring gratuity to Mr. Smith, our late Works Superintendent, who has retired after 28 years' service with this Company.

Provident Fund

The Provident Fund, a new item, was instituted at the request of our Covenanted Staff who did not come under the Gratuities and Pensions Scheme, and came into operation as from July 1, 1938. The Company pays contributions equal to those of the Staff, and the Fund is administered by two Directors as Trustees.

Gratuities are down by £190 and Passages are £544 higher. Two new assistants have been sent out to Calcutta, and more officers have been on leave. Insurances are higher by £30.

Turning now to the Revenue side. The increase in gas sold is nearly 17 million cu.ft.—and receipts therefrom are £1,710 higher. The Meter and Cooker Rentals more by £473. Residuals are lower by £500; tar was up by £840, more being sold and at a higher price, and the prospects for the current year seem hopeful. The reverse was the case with coke, which yielded less by £1,340. We sold less at a lower price and were left with a big stock on hand which I am glad to say has been materially reduced since. We are not manufacturing sulphate of ammonia, but have made a contract with a chemical firm in Calcutta for the sale of our surplus liquor, which contract should come into operation in the current year. Total receipts are £1,664 higher, and expenditure £13,971. Trading profit is £22,304, which is lower than that of 1937-38 by £12,127.

In view of the fall in value of stocks, the Directors have deemed it prudent to write off £3,103 from the value of investments, which now stand at the Stock Exchange value on June 30.

Interest received on cash is higher by £113, whereas that on investments is lower by £60, due to increase in taxation. Exchange profit is down by £670. Both the rate of exchange and the amount remitted have been lower during the year, though the former has recovered to some extent during this year. This is an item which, in the current year's accounts, will not altogether disappear but will be shown much reduced on one side or other of the Net Revenue account. Our accounts as from July 1 last are being kept at the rate of 1s. 6d. to the Rupee instead of 1s. 4d. as heretofore, and the various items on both sides of the Revenue Account will be higher in terms of sterling. The amount carried forward is increased by £3,540, which is less than one-fifth of the increase of the previous year.

Turning to the balance-sheet. There is no alteration in accounts 5 to 8, the amount due by the Company being £630 higher. On the other side Assets are higher by £7,120, £3,300 of this in cash held and £4,230 in stocks on hand. From these two must be deducted £440 less due to the Company.

During the year under review the gas sales have risen to a record height—nearly 644 million cu.ft.—a percentage increase of 2.62, and this comes on top of substantial increases in the preceding three years. Our sales of gas have been in the following proportions: Public lighting, 43.5%; private and domestic, 26.9%; industrial, 23.8%; and institutions, 5.8%.

We are selling more gas for industrial purposes, the percentage for 1937-38 having been 21.4. Of the 1,200 additional appliances sold over 100 were refrigerators.

Our relations with the Corporation have been most amicable, and earlier in this year we made a new agreement with them for the public supply at a reduced rate. This has to an extent affected the receipts, but next year's accounts will show the result of a full twelve months' reduction. The credit for this must go mainly to Mr. Savage and Mr. Lyle, who were engaged a long time in the ultimately successful negotiations. The number of public lamps lit has increased by 79.

The works, offices, and mains have been maintained in good order and you will doubtless be interested to hear what our large outlay already referred to covers. We installed a new Lancashire boiler, sunk a new tube well, added a second floor to the building at the Alipore holder station, and re-wired the electric power system for our carbonizing plant. Also the re-building of a section of the latter is proceeding. Of the main-laying programme outlined last year we have laid some 2½ miles of new main, chiefly in the north of the city.

The imminence of and final outbreak of war has thrown extra work and anxiety on our General Manager and his staff. Protection of the works and preparation for the rapid extinction of the public lamps have been arranged for. Our relations with other public utility companies remain excellent, and any question affecting the interests of all of us is dealt with after joint consultation. We have had no labour trouble, but there are always influences seeking to raise discontent, and these are watched unceasingly.

From what I have said, and your perusal of the accounts you will agree, I think, that the Company, although in a very healthy condition, has not had such a successful year as the previous one, and further we are committed to a large expenditure in the current year and also have unknown increases in taxation ahead of us. The Board have, therefore, with regret decided to recommend the final dividend subject to deduction of tax. You are not unprepared for this as I mentioned its possibility a year ago. In 1914 we discontinued paying the dividend free of tax, and this remained unchanged till 1933, since when we have paid tax free. We may, however, be thankful that we have not had to raise the price of gas which is now being forced upon Companies in Great Britain,

The CHAIRMAN then formally moved the adoption of the Report and Accounts, which was seconded by Mr. STANLEY H. JONES, M.Inst.C.E., and carried unanimously.

Dividends

The CHAIRMAN thereafter proposed:

"That a final dividend of 4½%, less income-tax, be declared, making 8% for the year ended June 30, 1939, and that

warrants for the same be sent by post to proprietors on Nov. 30."

This was seconded by Mr. H. H. MACLEOD and unanimously agreed.

Mr. WILLIAM GRAHAM BRADSHAW, C.B.E., moved the re-election to the Board of Mr. B. M. Gill and Mr. George Evetts, M.Inst.C.E., being the two Directors retiring by rotation at that meeting. It would be difficult, said Mr. Bradshaw, to find two gentlemen more suitable to be Directors of a Company such as theirs, and he could bear testimony to their great value to the Board.

Mr. STANLEY H. JONES seconded the resolution, which was carried unanimously, and Mr. GILL and Mr. EVETTS briefly acknowledged their re-election.

On the proposition of Mr. E. COWEE, seconded by Mr. R. H. GLEN, the Company's Auditors (Mr. S. W. Savage and Mr. F. J. Bradfield) were re-appointed, Mr. BRADFIELD returning thanks on behalf of his colleague and himself.

Votes of Thanks

Colonel PARKER said it would be ungracious to part without expressing a hearty vote of thanks to the Chairman and his colleagues on the Board, as well as to the whole staff of the Company both in Calcutta and London, for their conduct of the business during the past year. He did not think the technical management of any company operating so far afield could be bettered.

Mr. GLEN seconded the vote, remarking that he knew something of the difficulties which faced the staff of companies operating in the Far East, and they were all to be congratulated on the results achieved.

The CHAIRMAN, in acknowledging the vote of thanks, said he would like to supplement from that side of the table what had been said about the work of the staff in London and Calcutta. Their service in the Company's interests had been given to the full. Mr. Savage had had a year of very hard work handicapped by the absence from time to time of some of his assistants through illness. His work was shown by the repetition of the increase of sales and the renewal of the public lighting contract. He and Mr. Lyle were engaged in long and careful negotiations which were brought to a successful issue, and the new contract had been in operation since February of this year. The demands upon the Company by Government were always growing both as regards taxation and control, and the strain on the Staff was heavy. Mr. Gladstone, whose service was shared by the Bombay Company, had not been in Calcutta during the year under review. Mr. Lyle (who was with them that day) was home on sick leave, which was effecting a welcome improvement in his health. He was a member of the Municipality, and this added to the Company's standing in Calcutta. Mr. Bathgate, their Mains Superintendent, had his leave cut short owing to recall to India when War broke out. Mr. Lyle was also under recall. They had parted with regret with Mr. Smith, their late Works Superintendent, on his retirement in India, and he left with their good wishes after long service. Mr. Atkinson, their Accountant, had done most useful work in reform of accounting methods, speeding up collections, and by his tactful treatment of their consumers. Mr. Pope's work was what they always expected and obtained from him, and the increase in the number of appliances fixed largely stood to his credit. Messrs. Monson, Weldon, and Page, their latest joined members, had settled down in spite of some illness in course of acclimatization and had enabled Mr. Savage to give excellent reports of their working. Mr. Petts too did useful work when he was with them for part time. All their staff when on leave devoted some time to inspection of the newest plant and appliances and the result was shown in the returns. For this and their work in Calcutta they owed them their best recognition. As regards the London Office he would say it was not the most pleasant thing to be uprooted from one's home and transferred to a strange place for an indefinite period. They had taken it very well, and their work was going on very smoothly. Mr. Hentsch and his assistants deserved praise for the way they had carried on under such novel conditions.

Mr. EVETTS supported the vote of thanks from the Directors' side of the table. He observed that he knew personally practically the whole of the staff and had had the opportunity of seeing the work on the spot. They were all very able and, equally important, enthusiastic, and he asked the proprietors especially to recognize the work of Mr. Savage and Mr. Lyle in negotiating the contract which represented 43½% of their total business. They could well imagine the worry entailed in obtaining this contract and the success they felt when they had achieved it.

The SECRETARY acknowledged the vote on behalf of the London staff, and Mr. LYLE expressed the thanks of the personnel in India. None of them had any idea of where the War would lead them any more than they had at home, but they had a very keen and enthusiastic staff in Calcutta, all of whom would continue to do their best for the Company.

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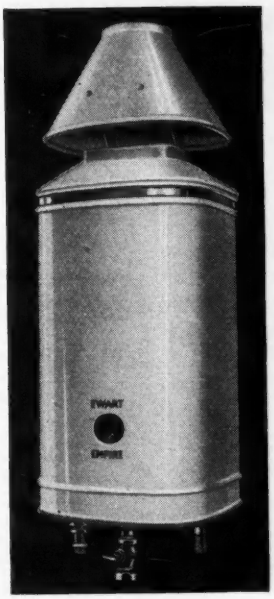

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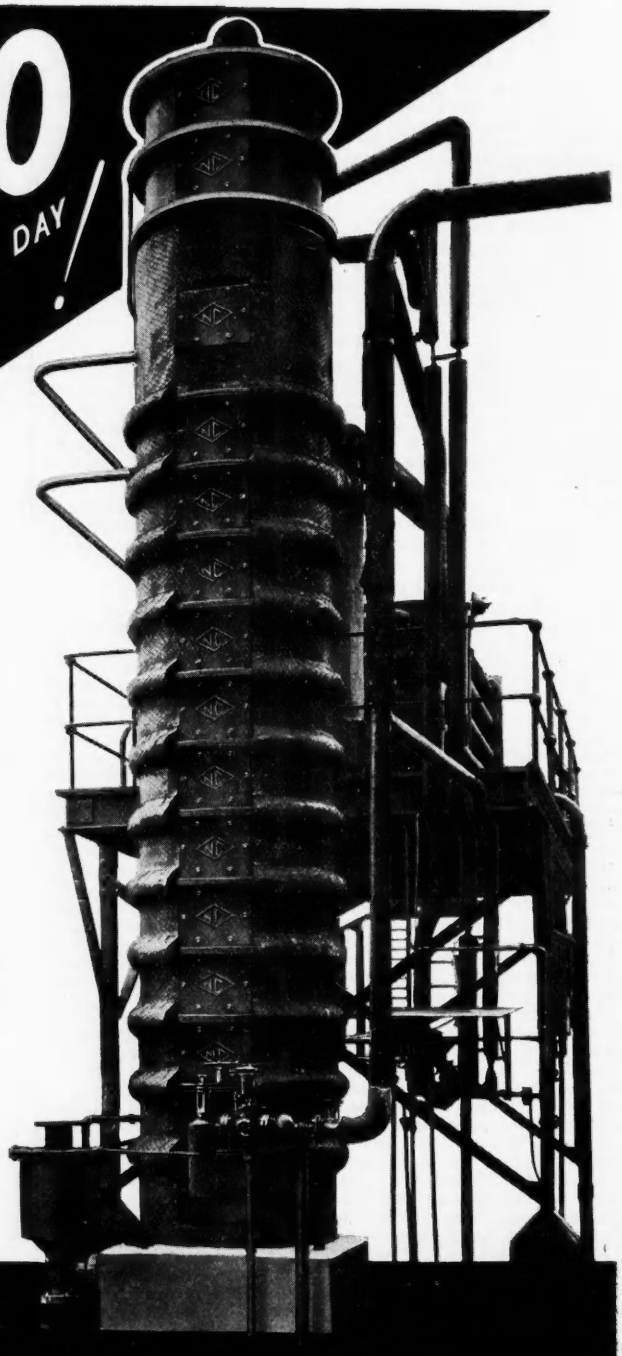

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The London Market

Dec. 4.

There is but little change to record in the values of tar products in the London market, which are as under :

Pitch about 32s. 6d. per ton f.o.b.
Creosote about 5d. per gallon.
Refined tar 3¾d. to 4d.

Toluole is now controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material can be sold.

Pure benzole about 1s. 10d.
95/160 solvent naphtha about 1s. 11d.
90/160 pyridine 14s. to 14s. 6d.
All per gallon naked.
Refined naphthalene crystals about £16 per ton in bags.
All *ex* makers' works.

The Provinces

Dec. 4.

Crude Gas-Works, Tar remains at 105.15s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were : Pitch—East Coast, 34s. to 35s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 34s. to 35s.* Toluole, naked, North—Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold. (This Order was in force at the date of last week's issue of the "JOURNAL," and the price of 1s. 10d. to 1s. 11d. then given should, therefore, not have been included. We apologize for not having made this correction before going to Press.) Coal tar, crude naphtha, in bulk, North, 8¾d. to 9¼d. Solvent naphtha, naked, North, 1s. 7d. to 1s. 8d. Heavy naphtha, North, 1s. 3d. to 1s. 4d. Creosote, *ex* works, in bulk, North, liquid and salty, 3⅞d. to 4⅛d.; low gravity, 4d. to 4¼d. Carbolic acid, 60's. 2s. 10d. to 3s. Naphthalene, £17 to £20. Salts, 80s. to 90s., bags included. Anthracene, "A" quality, 4¼d. to 4¾d. per minimum 40% purely nominal ; "B" quality, unsaleable. Heavy oil : Unfiltered anthracene oil, min. gr. 1,080. 5¼d. to 6d.; filtered anthracene oil, min. gr. 1,080, 6d. to 6¼d.; heavy tar oil, gr. less than 1,080, 5¼d. to 5¾d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW, Dec. 2.

Activity in this market continues on a moderate scale with prices steady to firm.

Crude gas-works tar.—Actual value is round 30s. to 32s. per ton *ex* works in bulk.

Pitch.—Abundant supplies of vertical quality are available at about 23s. to 24s. per ton, f.o.b. for export, and round 20s. to 22s. 6d. per ton *ex* works in bulk for home trade.

Refined tar.—Demand is practically non-existent and price in the home market is unchanged at 3¾d. to 4d. per gallon. For export, supplies can be secured at round 2¾d. to 3d. per gallon, filled into buyers' packages at makers' works.

Creosote oil.—Production is well looked after and prices are firms as follows : Specification oil, 4¾d. to 5d. per gallon ; low gravity, 5½d. to 5¾d. ; neutral oil, 5¼d. to 5½d. per gallon ; all *ex* works in bulk.

Cresylic acid.—Available supplies find a ready outlet with prices as follows : Pale, 97/99%, 2s. 2d. to 2s. 4d. per gallon ; dark, 97/99%, 1s. 10d. to 2s. per gallon ; pale, 99/100%, 2s. 6d. to 2s. 9d. per gallon ; all *ex* works in buyers' packages.

Crude naphtha is called 6d. to 6½d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 7½d. to 1s. 8½d. per gallon and 90/190 heavy naphtha is 1s. 3½d. to 1s. 4½d. per gallon.

Motor benzole remains at 1s. 6d. to 1s. 7d. per gallon.

Pyridine.—Values are nominal at 12s. to 13s. per gallon for 90/160 grade and 14s. to 15s. per gallon for 90/140 grade.

Contracts Advertised

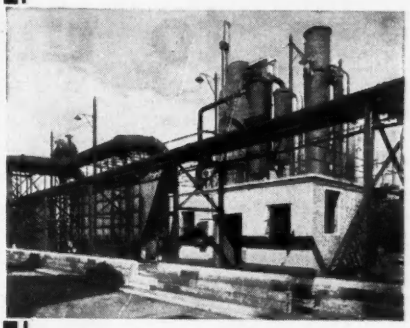
Gasholder Repairs.
Loughborough Gas Department. [p. 526.]

Resetting Retorts.
Brighouse Gas Department. [p. 526.]

Results at Padiham

The Padiham U.D.C. Gas Department has made a gross profit of £2,306 on the past year's working; but after deductions in respect of interest on loans, sinking fund charges, income tax, and interest on bank overdraft, there is a net loss of £807. The Gas Engineer (Mr. J. Roberts), in his annual report, states that gas sent out during the year amounted to 120,785,800 cu.ft., compared with 121,243,500 cu.ft. the previous year. The coke available for sale amounted to 9 cwt. per ton of coal carbonized. The average price received for coke was £1 8s. 11d., compared with £1 8s. 1½d. last year. There was a reduction of 28% in the price received for tar—the figure falling from £2 8s. 4d. per ton to £1 13s. 1d. The yield of crude benzole per ton of coal carbonized was increased during the final six months of the year as a result of slight modifications to the plant.

Every Joint Sound!



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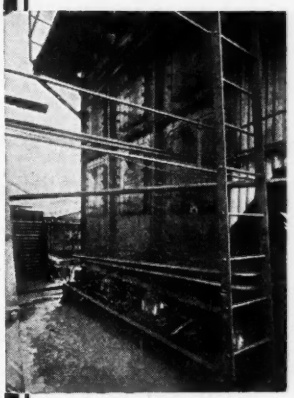

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GAS STOCKS AND SHARES

Markets were hesitant from the opening last week on the news of a possible breakdown of negotiations between Russia and Finland, and when hostilities actually commenced business for a time almost came to a standstill. By the end of the week, however, buyers began to appear, and some of the losses were partially recovered, especially among gilt-edged stocks. Home rails, which had been making good headway recently, were the chief sufferers, and several issues were severely marked down, though here again some small improvement was noticeable later. Leading industrials remained remarkably steady, a feature being those Indian issues with a local appeal. Mining shares were idle, and only small movements took place among oil and rubber shares.

The tone of the Gas Market was a little firmer last week, and the volume of business compared very favourably with some of the larger sections. Prices on the whole remained steady, and it is satisfactory to note that upward movements predominated. In the Official List most of the increases occurred among the fixed-interest stocks, though a few "ordinaries" also hardened, including Alliance and Dublin with a gain of 5 points and Mid Southern, which closed 2½ points higher. Gas Light units naturally had the largest following, and the quotation closed unchanged at 16s. 6d. South Metropolitan stock also attracted more attention, though the price went down a point to 64½ at the close. Imperial Continental remained steady at 78½. Prices at the Provincial Exchanges showed little variation, while in the Supplementary List it is interesting to note that the Peterborough stock followed up the previous week's gain of 30 with a further 10 points, and now stands 8½ points higher than before the war. Luton Consolidated also moved up 10 points to 120.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Dec. 1	Rise or Fall on Week.
1,767,439	Sept. 4	8	8	Alliance & Dublin Ord. ...	115—125	+5
374,000	June 19	4	4	Do. 4 p.c. Deb. ...	80—90	...
877,576	Nov. 6	5	5	Asscd. Gas & Water U'd'cts Ord.	14/6—16/6	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	17/6—19/6	...
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	16/—18/—	...
318,730	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	15/—17/—	...
750,000	Sept. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	80—85	...
560,870	Aug. 21	7	7	Barnet Ord. 7 p.c.	110—120	...
300,000	Oct. 9	1/9⅜	1/4⅜	Bombay, Ltd.	19/6—20/6	...
181,185	Aug. 21	9½	9½	Bournemouth Sliding Scale ...	135—145	...
690,526	,,	7	7	Do. 7 p.c. max. ...	115—125	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	110—120	...
50,000	June 5	3	3	Do. 3 p.c. Deb. ...	70—75	...
362,025	,,	4	4	Do. 4 p.c. Deb. ...	93—98	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...
357,900	Aug. 21	7½	7½	Brighton, &c., 6 p.c. Con. ...	105—110	...
459,955	,,	6½	6½	Do. 5 p.c. Con. ...	100—105	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref. ...	95—105	...
855,000	Sept. 18	8	7	British Ord.	90—100	...
100,000	June 19	7	7	Do. 7 p.c. Pref.	136—141	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	75—80	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	100—105	...
100,000	22 May '33	6	4	Cape Town, Ltd.	¼—¾	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref.	¼—¾	...
150,000	June 19	4½	4½	Do. 4½ p.c. Deb.	58—68	...
626,860	July 17	6	6	Cardiff Con. Ord.	95—105	...
237,860	June 5	5	5	Do. 5 p.c. Red. Deb. ...	97—102	...
98,936	Oct. 9	2/—	2/—	Colombo Ord.	1 7/16—1 7/16	+⅛
24,510	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	20/6—22/6	...
739,453	Sept. 27	—/11.48	—/11.48	Colonial Gas Assn. Ltd. Ord. ...	15/—17/—	...
296,144	,,	1/3.30	1/3.30	Do. 8 p.c. Pref.	20/6—22/6	...
1,775,005	July 31	4	4	Commercial Ord.	48—58	...
140,000	Aug. 21	4	4	Do. 4 p.c. Red. Pref. ...	88—93	...
620,000	June 5	3	3	Do. 3 p.c. Deb.	55—60	...
286,344	Aug. 21	5	5	Do. 5 p.c. Deb.	85—95	...
200,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	94— 99	...
807,560	July 31	7	7	Croydon sliding scale	100—110	...
644,590	,,	5	5	Do. max. div.	80—85	...
620,385	June 19	5	5	Do. 5 p.c. Deb.	90—100	...
208,660	Aug. 21	5	5	Dudley, Brierley Hill & Dist. Ord.	100—105	...
82,275	,,	5	5	Do. 5 p.c. Con. Pref. ...	92—102	...
79,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	94—99	...
239,000	July 31	5	5	East Hull Ord. 5 p.c.	86—91	...
187,215	Aug. 21	6	5⅜	East Surrey Ord. 5 p.c. ...	98—103	...
176,211	June 5	5	5	Do. 5 p.c. Deb. ...	90—100	...
250,000	Nov. 13	8	4	Gas Consolidation Ord. 'B' ...	17/—19/—	...
250,000	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	16/—18/—	...
9,172,463	July 31	5⅜	5⅜	Gas Light & Coke Ord. ...	16/—17/—a	...
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	58—63	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	76—81	...
2,993,000	July 3	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	80—85	...
8,602,497	Nov. 27	3	3	Do. 3 p.c. Con. Deb. ...	68—73*	+1
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	100—105*	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	95—100*	—2
700,000	Sept. 4	3½	3½	Do. 3½ p.c. Red. Ded. ...	85—90	...
270,466	July 31	6	6	Harrogate New Cons.	95—100	...
157,500	Mar. 20	‡1/—	‡1/—	Hong Kong and China Ord. ...	½—¾	...
5,600,000	Oct. 23	12	4	Imperial Continental Cap. ...	76—81	...
172,810	July 31	3½	3½	Do. 3½ p.c. Red. Deb. ...	81—86	—4
63,480	June 19	3	3	Maidstone 3 p.c. Deb.	57—62	...
45,000		†10	†8	Malta & Mediterranean ...	95—102*	—3
				Metropolitan (of Melbourne) ...		
392,000	Oct. 2	5½	5½	5½ p.c. Red. Deb.	95—100	...
231,977	Aug. 21	5	5	M.S. Utility 'C' Cons. ...	75—80	+2½
968,658	,,	4	4	Do. 4 p.c. Cons. Pref. ...	70—80	...
390,076	June 19	4	4	Do. 4 p.c. Deb. ...	75—85	...
148,955	June 19	5	5	M.S. Utility 5 p.c. Deb. ...	90—100	...
125,000	July 3	3½	3½	Do. 3½ p.c. Red. Bds. ...	92—95	...
675,000	Nov. 6	†3	†4	Montevideo, Ltd.	50—60	...
250,000	Aug. 21	7½	7½	North Middlesex 6 p.c. Con. ...	105—115	...
396,160	July 31	5	5	Northampton 5 p.c. max. ...	88—93	...
300,000	Nov. 6	†7	9	Oriental, Ltd.	118—128	...
468,537	June 5	7	8	Plymouth & Stonehouse 5 p.c.	100—110	...
621,667	July 31	8½	8½	Portsmouth & Gosport Cons.	110—120	...
241,446	,,	5	5	Do. 5 p.c. max.	78—83	...
73,350	,,	5	5	Do. 5 p.c. Pref.	80—90	...
75,000	,,	4	4	Do. 4 p.c. Pref.	70—80	...
114,000	July 31	5	5	Preston 5 p.c. Pref.	90—100	...
247,966	June 19	4	4	Primitiva 4 p.c. Cons. Deb. ...	95—100	...
625,959	July 17	4	4	Do. 4 p.c. Red. Deb. ...	93—98	...
15,000	Sept. 4	6	6	San Paulo 6 p.c. Cum. Pref. ...	7½—8½	...
441,275	Oct. 9	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	16/—19/—	...
460,810	Oct. 2	—/10⅜	—/10⅜	,, ,, 4½ p.c. Cum. Pref. ...	17/—19/—	...
133,201	Aug. 21	5	8½	Shrewsbury 5 p.c. Ord. ...	107—117	...
9,000	June 5	‡4	‡4	South African Ord.	4—5	...
1,996,297	Aug. 21	1/2⅜	1/2⅜	South East'n Gas Cn. Ld. Ord.	15/6—17/6	...
1,000,000	,,	—/10⅜	—/10⅜	Do. 4½ p.c. Red. Cum. Pref.	17/—19/—	...
769,191	,,	4	4	Do. 4 p.c. Cum. Pref. ...	14/6—16/6	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
6,709,895	July 31	6	5	South Met. Ord.	62—67	—1
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	97—102	+2
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	73—78	+½
1,895,445	June 19	3	3	Do. 3 p.c. Deb.	63—68	+3
1,000,000	July 17	5	5	Do. 5 p.c. Red. Deb. ...	97—102	...
600,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	92—97	...
1,543,795	July 31	6	6	South Suburban Ord. 5 p.c. ...	78—83	...
512,925	,,	5	5	Do. 5 p.c. Pref.	87—97	...
500,000	,,	4	4	Do. 4 p.c. Pref.	70—80	...
250,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	85—90	...
888,587	June 5	5	5	Do. 5 p.c. Deb.	90—100	...
250,000	,,	4	4	Do. 4 p.c. Deb.	75—85	...
200,000	July 31	3	3½	Do. 3½ p.c. Red. Deb. ...	85—90	...
427,859	Sept. 18	1/2⅜	9⅜	S. Western Gas & Water Ord.	14/—16/—	...
160,523	Oct. 9	—/10⅜	—/10⅜	Do. 4½ p.c. Red. Cum. Pref.	17/6—19/6	...
110,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	92—97	...
750,541	July 31	5½	5	Southampton Ord. 5 p.c. ...	75—85	...
148,836	June 5	4	4	Do. 4 p.c. Deb.	75—85	...
350,000	July 31	5½	5½	Swansea 5½ p.c. Red. Pref. ...	90—100	...
200,000	June 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—100	...
1,076,490	July 31	6½	6½	Tottenham and District Ord....	85—95	...
409,835	,,	5½	5½	Do. 5½ p.c. Pref.	95—105	...
62,235	,,	5	5	Do. 5 p.c. Pref.	85—95	...
453,380	June 19	4	4	Do. 4 p.c. Deb.	80—85	+2½
1,247,505	Oct. 23	6	4	U. Kingdom Gas Cor. Ord. ...	13/—16/—	...
1,085,952	Nov. 20	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	14/—16/—	...
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	14/6—16/6	...
745,263	June 5	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	12/6—14/6	...
1,093,656	Sept 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—95	...
378,106	Mar. 6	7	7	Uxbridge, &c., 5 p.c.	90—100	...
133,010	,,	5	5	Do. 5 p.c. Pref.	95—105	...
1,371,138	July 31	7	6½	Wandsworth Consolidated ...	88—93	+½
2,525,768	,,	4	4	Do. 4 p.c. Pref.	70—80	...
1,343,964	June 19	5	5	Do. 5 p.c. Deb.	90—100	...
383,745	,,	4	4	Do. 4 p.c. Deb.	75—85	...
400,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	92—97	...
558,342	July 31	6⅜	6⅜	Watford and St. Albans Ord. ...	90—100	...
200,000	,,	5	5	Do. 5 p.c. Pref.	85—95	+5
200,000	,,	5½	5½	Do. 5½ p.c. Pref.	90—100	...
200,000	,,	4	4	Do. 4 p.c. Rd. Pf. (1973/8)	85—90	...
100,000	—	—	—	Do. 4 p.c. Red. Pf. (1959)	95—100	...
200,000	June 19	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90	+2

a.—The quotation is per £1 of Stock. * Ex. Div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Contd.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations Dec. 1.	Rise or Fall on Week.
202,152	Sept. 4	5	5	Ascot Ord.	80—90	...
128,182	July 3	5	5	Do. 5 p.c. Pref. ...	90—95	...
31,035	Aug. 21	-/4⅜	-/4⅜	Associated Utilities 4 p.c. Pref.	15/—17/-	...
100,000	June 19	3⅛	3⅛	Do. 3½ p.c. Red. Deb. ...	90—95	...
17,000	Aug. 21	8	8	Bognor Orig. Ord. 'A' ...	105—115	...
62,210	,,	8	8	Do. New Add. 'A' ...	105—115	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	100—110	...
37,440	July 31	10	10	Cam. Univ. & Town 10 p.c. max.	110—120	...
125,970	,,	7	7	Do. 7 p.c. max.	90—100	...
39,025	,,	5	5	Do. 5 p.c. max.	80—90	...
96,410	July 17	4½	4½	Cardiff 4½ p.c. Pref.	92—97	...
55,520	July 31	6	6	Colchester 6 p.c. Pref.	100—110	...
90,550	Sept. 18	5	5	Do. 5 p.c. Deb. ...	100—105	...
150,000	July 31	4	4	Croydon 4 p.c. Pref.	70—75	...
130,000	June 19	4	4	Do. 4 p.c. Deb.	75—80	...
65,000	Aug. 21	7⅛	7⅛	Eastbourne 'A' 5 p.c.	105—115	...
198,000	,,	6	6	Do. 'B' 3½ p.c.	90—100	...
112,312	,,	5	5	Do. 5 p.c. Pref.	90—95	...
130,000	June 19	5	5	Do. 5 p.c. Deb.	95—105	...
130,500	Aug. 10	7½	7½	Exeter New Ord. (£10) ...	10—12	...
24,000	Aug. 21	8⅛	8⅛	Gt. Yarmouth 8½ p.c. max. (£30)	20—25	...
59,400	,,	7½	7½	Do. 7½ p.c. max. (£30) ...	17—22	...
51,160	June 5	5½	5½	Do. 5½ p.c. Deb.	100—110	...
152,690	Sept. 4	9	8	Guildford Cons.	110—120	...
54,055	,,	5	5	Do. 5 p.c. Pref.	90—95	...
68,250	June 5	5	5	Do. 5 p.c. Deb.	97—102	...
156,690	Aug. 21	7	7	Hampton Court Cons. ...	100—110	...
86,046	June 19	‡4½	‡5	Holyh'd&N.W.G.&W.Cpn.Ord.	13/6—15/6	...
80,000	Aug. 21	4	4	Lea Bridge 4 p.c. Pref.	65—75	...
60,000	,,	6	6	Do. 6 p.c. Pref.	105—115	...
94,876	June 5	4	4	Do. 4 p.c. Deb.	75—80	...
73,620	Sept. 18	8⅜	8⅜	Luton Cons. 'A'	115—125	+10
107,960	Sept. 18	5½	4	Mid Kent Ord. (£10)	7½—8½	-½
230,940	July 31	10	10	Oxford & District Ord. ...	130—140	...
47,112	,,	5	5	Do. 5 p.c. Pref.	85—95	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
126,193	Oct. 30	7½	7½	Peterborough Ord.	140—150	+10
64,990	Sept. 18	7½	7	Redditch Ord.	100—110	...
166,850	July 31	8	8	Romford Ord.	110—120	...
60,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
44,000	Sept. 18	5	5	Do. 5 p.c. Deb.	95—100	...
25,570	July 31	5½	5½	Rugby 5½ p.c. Pref.	95—105	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
42,750	June 5	5½	5½	Do. 5½ p.c. Deb.	105—110	...
110,950	Aug. 21	8	8	Ryde Ord.	110—120	...
270,086	Sept. 4	7	7	Slough Ord.	100—110	...
21,000	June 5	5	5	Do. 5 p.c. Deb.	95—100	.
28,872	Nov. 6	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	14/—16/-	...
28,866	Sept. 18	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
117,228	Aug. 21	7	5	Swindon Cons.	70—80	...
60,425	June 5	5	5	Do. 5 p.c. Deb.	95—100	...
64,380	June 19	5	5	Torquay & Paignton 5 p.c. Pref.	85—90	...
130,000	Aug. 21	8	5	Wakefield Ord.	85—95	...
81,650	,,	5	5	Do. 5 p.c. max.	75—80	...
82,000	July 31	6	6	Weymouth Ord.	80—90	..
273,626	Aug. 21	7	7	Wolverhampton Cons. Ord. ...	95—105	...
98,384	,,	6	6	Do. 6 p.c. Pref.	105—115	...
160,000	June 19	5½	5½	Do. 5½ p.c. Red. Deb. ...	100—105	...
106,490	Aug. 21	5½	5½	Wrexham Ord.	70—80	...
90,000	June 19	5	5	York 5 p.c. Red. Deb.	97—102	...
133,640	July 31	6½	6	Yorktown (Cam.) 5 p.c. Cons.	80—90	...
120,000	,,	5	5	Do. 5 p.c. Pref.	85—95	...
35,000	June 19	5½	5½	Do. 5½ p.c. Deb.	105—110	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Dec. 1	Rise or Fall on Week
347,756	July 31	6	5	Bath Cons.	107—112	...
1,667,250	,,	5	5	Bristol, 5 p.c. max.	97—100	-
120,420	June 5	4	4	Do. 1st 4 p.c. Deb.	89—93	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	89—93	...
328,790	,,	5	5	Do. 5 p.c. Deb.	110—113	...
274,000	July 31	5	5	Newport (Mon.) 5 p.c. max. ...	90—95	...
13,200	Sept. 4	8⅜	7	Pontyp'l Gas & W. 10 p.c. 'A'	12—13	...
13,600	,,	6	5	Do. 7 p.c. 'B'	10½—11	...
40,000	,,	6	5	Do. 7 p.c. 'C'	10½—11	...
140,778	July 31	5	5	Weston-super-Mare Cons. ...	93—98	...
64,338	June 19	4	4	Do. 4 p.c. Deb.	90—95	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	140—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Dec. 1	Rise or Fall on Week
157,150	July 31	6½	5	Chester 5 p.c. Ord.	100—103	...
92,500	June 5	4	4	Do. 4 p.c. Pref.	75—85	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	86—89	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—100	...
2,167,410	Aug. 21	6	6	Liverpool 5 p.c. Ord.	99—101	...
245,500	June 19	5	5	Do. 5 p.c. Red Pref. ...	90—95	...
306,083	July 17	4	4	Do. 4 p.c. Deb.	99—101	...
106,280	July 31	10	10	Preston 'A' 10 p.c.	174—184	...
188,219	,,	7	7	Do. 'B' 7 p.c.	126—136	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Dec. 1	Rise or Fall on Week
122,577	Aug. 21	8	8	Blyth 5 p.c. Ord.	146½—148½	...
732,000	Aug. 21	3	4	Hartlepool G. & W. Cn. & New	74½—76½	...
2,061,315	July 31	5¾	5	Newcastle & Gateshead Con.	17/9—18/3a	...
682,856	,,	4	4	Do. 4 p.c. Pref.	75—85	...
776,706	June 5	3½	3½	Do. 3½ p.c. Deb.	84—89	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	100—105	...
332,351	Aug. 21	6	6	Sunderland 6 p.c. max. ...	110—120	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Dec. 1	Rise or Fall on Week
542,270	Aug. 10	9	6	Derby Con.	105—115	...
55,000	June 19	4	4	Do. 4 p.c. Deb. ...	100—105	...
20,000	June 19	5	5	Long Eaton 5 p.c. Pref. ...	9—11	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	100—105	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Dec. 1	Rise or Fall on Week
10,000	Aug. 21	10	10	Great Grimsby 'A' Ord. ...	180—190	...
6,500	,,	10	10	Do. 'B' Ord. ...	180—190	...
79,000	,,	10	10	Do. 'C' Ord. ...	175—185	...
1,806,339	Feb. 20	6½	6½	Sheffield Cons.	119—122	-
95,000	July 3	4	4	Do. 4 p.c. Deb.	99—101	...

a The quotation is per £1 of Stock.
* Ex. div. ‡ For year.

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